OSHA REFERENCE MANUAL

OCCUPATIONAL SAFETY AND HEALTH COMPLIANCE SIMPLIFIED

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PREFACE

This OSHA REFERENCE MANUAL is dedicated specifically to those employers, business managers, safety directors, and supervisors whose responsibility it is to provide a safe and healthful work environment for their employees.

The Manual is intended to serve as a continuing guide for initiating and maintaining an effective, on-going safety and health program. It presents simplified guidelines for meeting the requirements of the Occupational Safety and Health Act of 1970, General Industry Safety and Health Regulations.

When properly used, taking full advantage of the various guides, self-inspection checklists, explanatory text, subpart overviews, bi-monthly supplements, and monthly OSHANEWS, the Manual provides the subscriber with the resources to develop new programs and improve existing programs. Such improvements in company safety and health programs can have dramatic effects on productivity, insurance costs, earnings, employee relations, and overall profit-making capabilities.

While every effort has been made to assure accuracy of information and correctness of recommended procedures, it is impossible to cover every aspect of all operations. The guidelines presented here are the simplified, not complete, requirements of the law. There may be laws pertaining to individual work establishments which are not covered by this Manual. Also, in states with approved "state plans," some additional regulations may apply. Therefore, each firm should apply the guides, recommendations, and checklists of this Manual according to its particular situation.

Should you wish to obtain a copy of the General Industry Standards, address your request to your local OSHA Regional Office. (For a listing of Regional and Area offices, see White Tab I, Regional Office of U.S. Dept. of Labor.) Or, the standards may be purchased from the U.S. Government Printing Office, Superintendent of Documents, Washington, DC 20402.

By using this Manual, the user agrees that Insurors Press Inc., White & White Technical Services, Inc., The Merritt Company, and its authors will not be held liable for any damages resulting directly from the use of information contained herein or from any errors or omissions.

HOW TO USE THIS MANUAL

This OSHA Reference Manual is divided into 10 sections, separated by clearly marked tabs.

Volume I. The sections below (red tabs) require specific action on the part of employers. Use the list below as an over-all checklist to see that you have found each of the sections and taken appropriate action:

☐ Step 1 Posting of Notices
☐ Step 2 Written Records
☐ Step 3 Emergency Reports
☐ Step 4 Self-Inspection Program

Volume II. Step 5 (yellow tabs) outlines steps that should be taken in order to further comply with requirements of the OSH Act. While many of the suggestions contained in this section are not required specifically by law, it is the opinion of the editors of this Manual that compliance with this section is necessary in order to establish good faith and avoid an OSHA citation.

Each subpart (A-Z) opens with a general overview, designed to assist subscribers in determining whether the section applies to their operations. While it is not always possible to identify the specific industries to which the subpart applies, we have endeavored to identify the processes and activities covered.

☐ Step 5 Safety Program Implementation & Evaluation

The remainder of Volume II (blue tabs) contains information that will help you carry out the requirements and suggestions presented in Steps 1 through 5:

☐ Step 6 Inspection by the OSHA Official
☐ Step 7 Citations, Penalties, and Imminent Danger
☐ Step 8 Variances
☐ Step 9 SBA Loans
☐ Step 10 Legal Considerations of OSHA

Study this Manual, and take the steps or specifications applicable to your firm. When the bimonthly supplements arrive, again evaluate and revise your company's efforts to comply with OSHA.

SCOPE AND PURPOSE OF THE OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970
(OSHA)

The Williams-Steiger Occupational Safety and Health Act was signed into law on December 29, 1970. It provides that every employer engaged in business affecting commerce shall: (1) furnish to each employee a place of employment free from recognized hazards that are causing or are likely to cause death or serious physical harm; and (2) comply with Occupational Safety and Health Standards promulgated under the Act: OSHA thereby extends coverage to all employers not subject to previously existing Federal safety acts.

OSHA also provides that each employee shall comply with the Occupational Safety and Health Standards and rules, regulations, and orders pursuant to the Act that are applicable to his own actions and conduct. No penalties or enforcement provisions are applied to an employee who does not comply with the law. **Penalties apply only to the employer.**

To assure the broadest application of the Act, the Congress utilized the commerce clause, stating that every employer "affecting commerce" would be subject to the provisions of the law. This means that virtually every employer in industry, business, and farming is covered if he employs *one* or more persons. It is estimated that OSHA covers more than 57 million workers.

OSHA is administered and enforced by the Department of Labor and the Department of Health, Education, and Welfare.

The U.S. Department of Labor is responsible for:
- Developing and promulgating safety and health standards
- Inspecting and investigating work sites
- Enforcing standards and proposing penalties for violators
- Collecting work injury and illness data

The U.S. Department of Health, Education, and Welfare is responsible for:
- Developing criteria for safety and health standards
- Carrying out research and development
- Establishing professional training and education programs
- Keeping accident records and logs

The Occupational Safety and Health Review Commission is responsible for:
- Hearing employer cases contesting citations, penalties, and abatement periods
- Hearing employee cases contesting abatement periods
- Affirming, modifying, or vacating orders

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- Arranged alphabetically by state

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POSTING OF NOTICES

A copy of each of the notices described below must be posted in each work establishment. ''Establishment'' means a single physical location where business is conducted or where services or industrial operations are performed. Notices should be prominently displayed, preferably on a bulletin board or at a location or locations that would provide greatest exposure to employees.

The required notices are described below and examples are illustrated on the pages following.

I. POSTER: ''SAFETY AND HEALTH PROTECTION ON THE JOB'' 1903.2(a)
See illustration page 1—2.

Each employer shall post and keep posted a notice or notices to be furnished by the Occupational Safety and Health Administration, Dept. of Labor. (See White Tab ''Regional Offices U.S. Dept. of Labor and OSHA,'' in Volume 2 for numbers.)

II. EMERGENCY PHONE NUMBERS
See illustration page 1—3.

This notice should be posted in conspicuous locations and show current telephone numbers for quickly obtaining medical assistance, hospital, ambulance, fire department or police.

III. SUMMARY OF OCCUPATIONAL INJURIES — OSHA Form 200 — 1904.5(d)(1)
See pages 1—4 and 2—6 and 2—7.

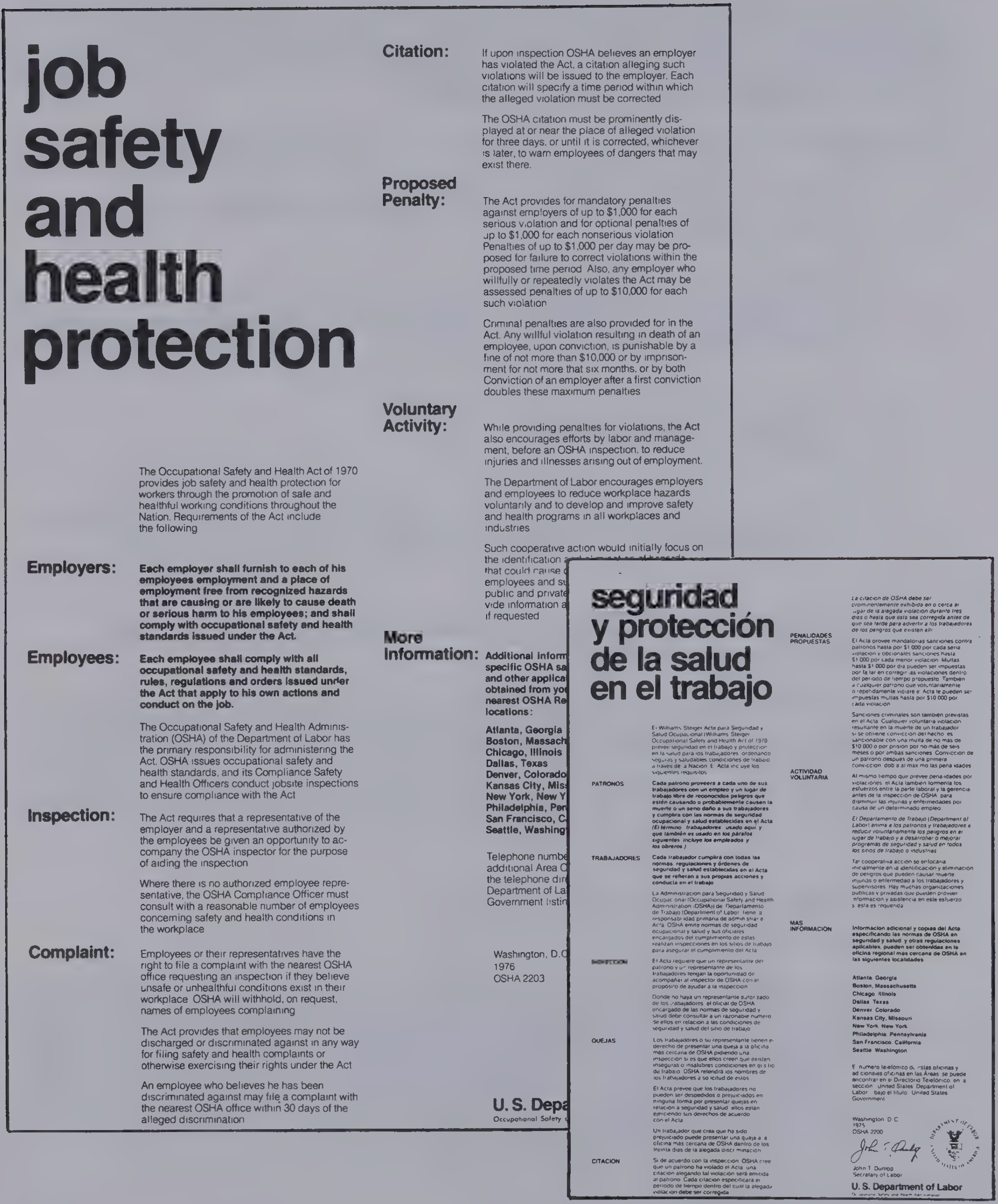
OSHA Form 200 is used to maintain a log and cumulative summary of all recordable injuries and illnesses. The last page of the summary portion is to serve as the final summary for the calendar year. It must be completed, signed and certified by the employer or a designated employee and posted no later than February 1, as the summary for the immediate preceding year. This summary is to remain posted for a period of 30 days and be kept on file for five years.

IV. FLOOR LOAD PROTECTION 1910.22(d)(1)
See page 1—5.

In every building or other structure, or part thereof, used for storage purposes, the loads approved by the building official shall be marked on a plate which shall be supplied and securely affixed by the owner of the building, or his or her duly authorized agent. The plates shall be made of durable material, of a reasonable size, of approved design, and posted in a conspicuous place in each space to which they relate. Such plates shall not be removed or defaced; but if lost, removed or defaced, shall be replaced by the owner or his or her agent.

V. CITATIONS
Not Illustrated

If received by an employer after an OSHA compliance inspection, the citation must be posted at or near the place of the alleged violation.



job safety and health protection

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers through the promotion of safe and healthful working conditions throughout the Nation. Requirements of the Act include the following

Employers: **Each employer shall furnish to each of his employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to his employees; and shall comply with occupational safety and health standards issued under the Act.**

Employees: **Each employee shall comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to his own actions and conduct on the job.**

The Occupational Safety and Health Administration (OSHA) of the Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to ensure compliance with the Act

Inspection: The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace

Complaint: Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace OSHA will withhold, on request, names of employees complaining

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or otherwise exercising their rights under the Act

An employee who believes he has been discriminated against may file a complaint with the nearest OSHA office within 30 days of the alleged discrimination

Citation: If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty: The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000 or by imprisonment for not more that six months, or by both Conviction of an employer after a first conviction doubles these maximum penalties

Voluntary Activity: While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce injuries and illnesses arising out of employment.

The Department of Labor encourages employers and employees to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries

Such cooperative action would initially focus on the identification
that could cause
employees and su
public and private
vide information a
if requested

More Information: **Additional inform
specific OSHA sa
and other applica
obtained from yo
nearest OSHA Re
locations:**

Atlanta, Georgia
Boston, Massach
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Mis
New York, New Y
Philadelphia, Pen
San Francisco, C
Seattle, Washing

Telephone numbe
additional Area O
the telephone dir
Department of La
Government listin

Washington, D.C
1976
OSHA 2203

U. S. Depa
Occupational Safety

seguridad y protección de la salud en el trabajo

El Williams Steiger Acta para Seguridad y Salud Ocupacional (Williams Steiger Occupational Safety and Health Act of 1970 prevee seguridad en el trabajo y protección en la salud para los trabajadores ordenando seguras y saludables condiciones de trabajo a traves de la Nacion El Acta incluye los siguientes requisitos

PATRONOS **Cada patrono proveera a cada uno de sus trabajadores con un empleo y un lugar de trabajo libre de reconocidos peligros que estén causando o probablemente causen la muerte o un serio daño a sus trabajadores y cumplira con las normas de seguridad ocupacional y salud establecidas en el Acta** ***(El término trabajadores usado aquí, y que también es usado en los párrafos siguientes incluye los empleados y los obreros.)***

TRABAJADORES **Cada trabajador cumplirá con todas las normas, regulaciones y órdenes de seguridad y salud establecidas en el Acta que se refieran a sus propias acciones y conducta en el trabajo**

La Administracion para Seguridad y Salud Ocupacional (Occupational Safety and Health Administration (OSHA)) de Departamento de Trabajo (Department of Labor tiene a responsabilidad primaria de administrar el Acta OSHA emite normas de seguridad ocupacional y salud y sus oficiales encargados del cumplimiento de estas realizan inspecciones en los sitios de trabajo para asegurar el cumplimiento del Acta

[illegible] El Acta requiere que un representante del patrono y un representante de los trabajadores tengan la oportunidad de acompañar al inspector de OSHA con el propósito de ayudar a la inspeccion

Donde no haya un representante autorizado de los trabajadores el oficial de OSHA encargado de las normas de seguridad y salud debe consultar a un razonable numero de ellos en relacion a las condiciones de seguridad y salud del sitio de trabajo

QUEJAS Los trabajadores o su representante tienen el derecho de presentar una queja a la oficina más cercana de OSHA pidiendo una inspección si es que ellos creen que existen inseguras o insalubres condiciones en el sitio de trabajo OSHA retendrá los nombres de los trabajadores a solicitud de estos

El Acta prevee que los trabajadores no pueden ser despedidos o prejuiciados en ninguna forma por presentar quejas en relación a seguridad y salud ellos están ejerciendo sus derechos de acuerdo con el Acta

Un trabajador que crea que ha sido prejuiciado puede presentar una queja a la oficina más cercana de OSHA dentro de los treinta dias de la alegada discriminación

CITACION Si de acuerdo con la inspección OSHA cree que un patrono ha violado el Acta una citación alegando tal violación será emitida al patrono Cada citacion especificara el periodo de tiempo dentro del cual la alegada violacion debe ser corregida

La citacion de OSHA debe ser prominentemente exhibida en o cerca al lugar de la alegada violacion durante tres dias o hasta que esta sea corregida antes de que sea tarde para advertir a los trabajadores de los peligros que existen alli

PENALIDADES PROPUESTAS El Acta provee mandatorias sanciones contra patronos hasta por $1 000 por cada seria violacion y opcionales sanciones hasta $1 000 por cada menor violacion Multas hasta $1 000 por dia pueden ser impuestas por fallar en corregir las violaciones dentro del periodo de tiempo propuesto También a cualquier patrono que voluntariamente o repetidamente violare el Acta le pueden ser impuestas multas hasta por $10 000 por cada violación

Sanciones criminales son también previstas en el Acta Cualquier voluntaria violación resultante en la muerte de un trabajador si se obtiene convicción del hecho es sancionable con una multa de no mas de $10 000 o por prision por no más de seis meses o por ambas sanciones Convicción de un patrono despues de una primera convicción dobla al maximo las penalidades

ACTIVIDAD VOLUNTARIA Al mismo tiempo que prevee penalidades por violaciones el Acta también fomenta los esfuerzos entre la parte laboral y la gerencia antes de la inspección de OSHA para disminuir las injurias y enfermedades por causa de un determinado empleo

El Departamento de Trabajo (Department of Labor) anima a los patronos y trabajadores a reducir voluntariamente los peligros en el lugar de trabajo y a desarrollar o mejorar programas de seguridad y salud en todos los sitios de trabajo o industrias

Tal cooperativa acción se enfocaria inicialmente en la identificación y eliminación de peligros que pueden causar muerte injurias o enfermedad a los trabajadores y supervisores Hay muchas organizaciones publicas y privadas que pueden proveer informacion y asistencia en este esfuerzo si esta es requerida

MAS INFORMACION **Informacion adicional y copias del Acta, especificando las normas de OSHA en seguridad y salud y otras regulaciones aplicables, pueden ser obtenidas en la oficina regional más cercana de OSHA en las siguientes localidades**

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

El numero telefónico de estas oficinas y adicionales oficinas en las Áreas se puede encontrar en el Directorio Telefónico en la sección United States Department of Labor bajo el titulo United States Government

Washington D C
1975
OSHA 2200

John T. Dunlop

John T Dunlop
Secretary of Labor

U. S. Department of Labor
Occupational Safety and Health Administration

Poster in Spanish Language
may also be required.

Job Safety and Health Protection Poster.

EMERGENCY PHONE NUMBERS

PHYSICIAN ______________________ **or** ________________

HOSPITAL ______________________ **or** ________________

AMBULANCE ______________________ **or** ________________

FIRE DEPARTMENT ________________ **or** ________________

PARAMEDIC ______________________ **or** ________________

POLICE _________________________ **or** ________________

	Name	Phone No.
Company OSHA Coordinator	______________	____________

Post in a conspicuous location.

Emergency phone numbers notice — to be displayed in all needed places.

U.S. Department of Labor

INJURY / ILLNESS SUMMARY

For Calendar Year 19 ______ Page____(b) of_____

Company Name ________________

Establishment Name ________________

Establishment Address ________________

Form Approved
O.M.B. No. 44R 1453

	EXTENT OF AND OUTCOME OF INJURY						**TYPE, EXTENT OF, AND OUTCOME OF ILLNESS**												
	FATALITIES	NONFATAL INJURIES					TYPE OF ILLNESS							FATALITIES	NONFATAL ILLNESSES				
	INJURY RELATED	INJURIES WITH LOST WORKDAYS				INJURIES WITHOUT LOST WORKDAYS	7 **CHECK** Only one column for each illness (See instructions for terminations or permanent transfers.)							ILLNESS RELATED	ILLNESSES WITH LOST WORKDAYS				ILLNESSES WITHOUT LOST WORKDAYS
	1	2	3	4	5	6	a	b	c	d	e	f	g	8	9	10	11	12	13
	Enter **DATE** of death. Mo./day/yr.	Enter a **CHECK** if injury involves days away from work, or days of restricted work activity, or both.	Enter a **CHECK** if injury involves days away from work	Enter number of **DAYS** away from work.	Enter number of **DAYS** of restricted work activity.	Enter a **CHECK** if no entry was made in columns 1 or 2 but the injury is recordable as defined above.	Occupational skin diseases or disorders	Dust diseases of the lungs	Respiratory conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeat trauma	All other occupational illnesses	Enter **DATE** of death. Mo./day/yr.	Enter a **CHECK** if illness involves days away from work, or days of restricted work activity, or both	Enter a **CHECK** if illness involves days away from work.	Enter number of **DAYS** away from work.	Enter number of **DAYS** of restricted work activity.	Enter a **CHECK** if no entry was made in columns 8 or 9.
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

Certification of Annual Summary Totals By ________________ Title ____________ Date __________

OSHA No. 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1.

OSHA FORM 200 — INJURY / ILLNESS SUMMARY
See Written Records page 2—4 for instructions.

FLOOR LOAD
__________ lb. PER
SQUARE FOOT

Typical Floor Load Protection Plate. Rated load weight to be shown in place provided. Plates such as this are to be provided by the building owner or an authorized agent and affixed at all needed locations. Plates are to be of reasonable size and of durable material.

Written Records

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WRITTEN RECORDS

This section provides information about the written records that must be maintained to comply with OSHA. The trend has been towards a lighter paperwork burden for companies, and many industries have been exempted from keeping certain OSHA records. However, it is very important to keep those records for which you are responsible, since OSHA reviews records first during any inspection and uses its findings to decide whether further inspection is necessary. Although OSHA's major interest lies in abatement, if an employer knowingly falsifies records and OSHA can prove it, the employer can face a fine of up to $10,000 and a six month jail term.

> NOTE: It is very important to remember that OSHA recordkeeping requirements are independent of any workers compensation laws or rulings of any state. Also, OSHA requires federal reporting that is different from any state law or regulation.

TYPES AND FORMS OF RECORDS

In the case of occupational injury and illness records, certain prescribed formats should be used. These forms are available on request and can be obtained from your nearest OSHA office, Bureau of Labor Statistics Office, or from a state agency. Where no specific form is required, the record can be of your own design as long as it contains all pertinent data as required by the standard. The following pages outline a number of these required records along with some illustrations and sample forms. These samples can be used to develop your own records forms. Subscribers to the OSHA Reference Manual may freely reproduce any of the forms provided for their own use.

Anyone who wishes to maintain records by a different procedure than outlined in the OSHA regulations must petition OSHA for an exception ruling. For more information on petitioning for a recordkeeping variance, contact the nearest OSHA area office.

INJURY AND ILLNESS RECORDS

By far the most important records are those kept of employee injuries and illnesses in the workplace. These records are designed to help compliance officers when they visit a worksite for an inspection, but can be of even greater help to the employer in identifying ''trouble spots'' and hazards in the workplace.

Who Must Keep Injury/Illness Records

OSHA injury and illness records are required of employers in the following industries who have 11 or more employees:

Agriculture, forestry, and fishing (SICs 01-02 and 07-09)
Oil and gas extraction (SIC 13 and 1477)
Construction (SICs 15-17)
Manufacturing (SICs 20-39)
Transportation and public utilities (SICs 41-42 and 44-49)
Wholesale trade (SICs 50-51)
Building materials and garden supplies (SIC 52)
General merchandise and food stores (SICs 53-54)
Hotels and other lodging places (SIC 70)

Repair services (SICs 75-76)
Amusement and recreation services (SIC 79)
Health services (SIC 80)

The following retail, trade, finance, insurance, real estate, and services industries do not normally have to keep OSHA injury and illness records:

Automotive dealers and gasoline service stations (SIC 55)
Apparel and accessory stores (SIC 56)
Furniture, home furnishings, and equipment stores (SIC 57)
Eating and drinking places (SIC 58)
Miscellaneous retail (SIC 59)
Banking (SIC 60)
Credit agencies other than banks (SIC 61)
Security, commodity brokers, and services (SIC 62)
Insurance (SIC 63)
Insurance agents, brokers, and services (SIC 64)
Real estate (SIC 65)
Combined real estate, insurance, etc. (SIC 66)
Holding and other investment offices (SIC 67)
Personal services (SIC 72)
Business services (SIC 73)
Motion pictures (SIC 78)
Legal services (SIC 81)
Educational services (SIC 82)
Social services (SIC 83)
Museums, botanical, zoological gardens (SIC 84)
Membership organizations (SIC 86)
Private households (SIC 88)
Miscellaneous services (SIC 89)

Each year, a small sample of these industries is required to keep records to participate in the Bureau of Labor Statistics' annual survey of occupational injuries and illnesses. Also, these employers must comply with OSHA standards, display the OSHA poster, and report to OSHA within 48 hours any accident which results in a fatality or in the hospitalization of five or more employees. Lastly, some state programs may require these employers to keep injury and illness records even though the federal government does not.

Exemptions

Excluded entirely from OSHA recordkeeping are:

- Small employers who at no time during the year had more than 10 employees.*
- Self employed individuals
- Partners with no employees
- Employers of household domestics
- Employers whose employees are engaged in the performance of religious services, such as clergy, choir members, organists, ushers, etc.

*Employers with 10 or fewer employees must keep records if asked to participate in the Bureau of Labor Statistics' annual survey of occupational illnesses and injuries. Small employers must still report fatalities or accidents resulting in the hospitalization of five or more employees. States may also extend recordkeeping requirements to all employers regardless of size.

Log and Summary of Occupational Injuries and Illnesses (OSHA # 200)

(See sample on page 2—6 and 2—7)

The OSHA Form #200 is the combination log and summary form which all employers subject to recordkeeping requirements should use. If an alternative form is used, it must be as readable and comprehensible to a person not familiar with it as the OSHA Form #200 is. Computerized recordkeeping is allowed, however, two requirements must be met: sufficient information must be available at the computer location to complete the log within six work days after receipt of information that a recordable case has occurred, and a copy of the log updated to within 45 calendar days must be present at all times at the establishment.

The log and summary form (#200) is presented in reproducible form for printing or photocopying on pages 2—6 and 2—7. The required data can be recorded with ''log'' entries in the left hand pages, and cumulative ''summary'' entries on the right hand pages. Instructions for filling out the log and summary can be found below. Since not every injury or illness occurring in the workplace is recordable, charts to help determine the recordability of occupational injuries and illnesses can be found on pages 2—12 and 2—13. The summary portion of the form (the right hand side) is the cumulative record to be posted at the end of the calendar year (no later than February 1 of the year immediately following) and remain posted until March 1.

Instructions for Completing the Log and Summary (OSHA Form #200)

Columns A through F (Left Page)

Column A

Enter case or file number.

Column B

Enter date of injury or onset of illness:

- for injuries enter date of work accident resulting in injury.
- for occupational illness enter date of initial diagnosis, or, if absence from work occurred before diagnosis, enter first day of absence attributable to the illness.

Column C

Enter employee's name (first name or initial, middle initial, last name).

Column D

Enter occupation — job title or duties of employee.

Column E

Enter department or workplace in which the employee is regularly employed or assigned.

Column F

Enter description of injury or illness briefly stated.
Indicate part or parts of body affected.

Columns 1 through 13 (Right Page)

Injury-Related Entries: Columns 1 through 6

Column 1

Enter date(s) of any injury-related fatalities.

Column 2

Enter a check if injury resulted in lost workdays or days of restricted activity.

Column 3

Enter a check if injury resulted in days away from work.

Column 4

Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of the injury. Do not include the day of the injury or days on which the employee would not have worked even if able.

In instances where the employee does not have a regularly scheduled shift (is a part-time employee, casual laborer, etc.) it may be necessary to estimate the number of lost workdays based on prior work history of the employee AND comparison with days worked by other employees in the same department and/or occupation as the ill or injured employee.

Column 5

Enter number of workdays (consecutive or not) on which because of the injury the employee was:

(1) assigned to another job on a temporary basis;
(2) working at a permanent job less than full time; or
(3) worked at a permanently assigned job but could not perform all duties normally connected with it.

NOTE: The number of lost workdays should not include the day of injury or any days on which the employee would not have worked even if able to work.

Bureau of Labor Statistics
Log and Summary of Occupational
Injuries and Illnesses

INJURY / ILLNESS LOG

Page____(a) of_____

NOTE: This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain and post can result in the issuance of citations and assessment of penalties. (See posting requirements)

RECORDABLE CASES: You are required to record information about every occupational **death**; every nonfatal occupational **illness**; and those nonfatal occupational **injuries** which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid). (See definitions.)

CASE OR FILE NUMBER	DATE OF INJURY OR ONSET OF ILLNESS	EMPLOYEE'S NAME	OCCUPATION	DEPARTMENT	DESCRIPTION OF INJURY OR ILLNESS
Enter a nonduplicating number which will facilitate comparisons with supplementary records.	Enter Mo./day.	Enter first name or initial, middle initial, last name.	Enter regular job title, not activity employee was performing when injured or at onset of illness. In the absence of a formal title, enter a brief description of the employee's duties.	Enter department in which the employee is regularly employed or a description of normal workplace to which employee is assigned, even though temporarily working in another department at the time of injury or illness.	Enter a brief description of the injury or illness and indicate the part or parts of body affected. Typical entries for this column might be: Amputation of 1st joint right forefinger; Strain of lower back; Contact dermatitis on both hands; Electrocution — body.
A	B	C	D	E	F
					PREVIOUS PAGE TOTALS →
1					
2					
3					
4					
5					
6					
7					
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9					
10					
11					
12					
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14					
15					
16					
17					
18					
19					
20					
					TOTALS (See instructions) →

OSHA No. 200

U.S. Department of Labor

INJURY / ILLNESS SUMMARY

For Calendar Year 19 ________ Page____(b) of______

Company Name

Establishment Name

Establishment Address

Form Approved
O.M.B. No. 44R 1453

	EXTENT OF AND OUTCOME OF INJURY						TYPE, EXTENT OF, AND OUTCOME OF ILLNESS												
	FATALITIES	NONFATAL INJURIES					TYPE OF ILLNESS							FATALITIES	NONFATAL ILLNESSES				
	INJURY RELATED	INJURIES WITH LOST WORKDAYS				INJURIES WITHOUT LOST WORKDAYS	7 **CHECK** Only one column for each illness (See instructions for terminations or permanent transfers.)							ILLNESS RELATED	ILLNESSES WITH LOST WORKDAYS				ILLNESSES WITHOUT LOST WORKDAYS
	1	2	3	4	5	6	a	b	c	d	e	f		8	9	10	11	12	13
	Enter **DATE** of death. Mo./day/yr.	Enter a **CHECK** if injury involves days away from work, or days of restricted work activity, or both.	Enter a **CHECK** if injury involves days away from work.	Enter number of **DAYS** away from work.	Enter number of **DAYS** of restricted work activity.	Enter a **CHECK** if no entry was made in columns 1 or 2 but the injury is recordable as defined above.	Occupational skin diseases or disorders	Dust diseases of the lungs	Respiratory conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeat trauma	All other occupational illnesses	Enter **DATE** of death. Mo./day/yr.	Enter a **CHECK** if illness involves days away from work, or days of restricted work activity, or both.	Enter a **CHECK** if illness involves days away from work.	Enter number of **DAYS** away from work.	Enter number of **DAYS** of restricted work activity.	Enter a **CHECK** if no entry was made in columns 8 or 9.
1																			
2																			
3																			
4																			
5																			
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20																			

Certification of Annual Summary Totals By ________________ Title ________________ Date ________________

OSHA No. 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1.

Column 6

Enter a check if recordable injury did not involve lost workdays

Illness-Related Entries: Columns 7 through 13

Column 7 (a through g)

Enter a check in only one column for each illness.
If the illness resulted in termination of employment or permanent transfer, place an asterisk to the right of the checkmark entry.

Column 8

Enter the date of any illness-related fatality.

Column 9

Enter check if illness resulted in lost workdays or days of restricted activity.

Column 10

Enter check if illness resulted in days away from work.

Column 11

Enter the number of days away from work (consecutive or not) due to illness. Do not include the day of the illness or days on which the employee would not have worked even if able.
In instances where the employee does not have a regularly scheduled shift (is a part-time employee, casual laborer, etc.) it may be necessary to estimate the number of lost workdays based on prior work history of the employee AND comparison with days worked by other employees in the same department and/or occupation as the ill or injured employee.

Column 12

Enter number of workdays (consecutive or not) on which because of the illness the employee was:

(1) assigned to another job on a temporary basis;
(2) working at a permanent job less than full time; or
(3) worked at a permanently assigned job but could not perform all duties normally connected with it.

NOTE: The number of lost workdays should not include the day of the onset of illness or any days on which the employee would not have worked even if able to work.

Column 13

Enter check if recordable illness did not involve lost workdays.

Changes in Extent or Outcome of Injury or Illness

If, during the five year period the log must be retained, there is a change in the outcome of an injury or illness for which an entry was made in columns 1,2,6,8,9, or 12, the first entry should be lined out and a new entry made. For example:

If an employee who had been injured required only medical treatment, it would be recorded in column 6. If the injury later resulted in lost workdays away from work, the checkmark in column 6 should be lined out and checks entered in columns 2 and 3, and the number of lost workdays entered in column 4.

If an employee with an occupational illness lost workdays, returned to work, and then died of the illness, entries in columns 9 and 10 should be lined out and the date of death entered in column 8.

Entries for injuries or illnesses which are later determined to be nonrecordable (see Charts 1 and 2) should be lined out. Examples:

An injury or illness is determined to be not work-related;

An injury initially thought to involve medical treatment is later determined to have only involved first aid.

TOTALS

Enter totals at bottom of each column and then in the upper section of columns on the next page (previous page totals).

Columns 1 and 8: Add total number of fatalities.

Columns 2,3,6,7,9,10, and 13: Add total number of checks in each column.

Columns 4,5,11, and 12: Add the number of days entered in each column.

Totals should be generated for each column at the end of each page and at the end of each year. ONLY the yearly totals are required for posting.

If an employee's loss of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already entered as lost workdays and include this figure in the annual totals. No further entries should be made with respect to such cases in the next year's log and summary.

Supplementary Record (OSHA #101)

(See sample on page 2—11)

In addition to the OSHA Form #200, each employer must have available for inspection at each establishment a supplementary record for each recordable occupational injury or illness. The record must be completed in detail and be available within six working days after receiving information that a recordable case has occurred. Workers compensation, insurance, or other reports are acceptable if they contain the required information, which appears below. Any missing items may be added somewhere on the other form or on an attachment.

The supplementary record must contain the following:

1. The employer's name, mail address, and location if different than mail address.
2. Injured or ill employee's name, social security number, home address, age, sex, occupation, and department.

3. Accident or exposure details — place of the accident or exposure, whether it was on the employer's premises, what the employee was doing when injured, and how the accident occurred.
4. Occupational injury or illness details — description of the injury or illness, part or parts of body affected, name of the object or substance which directly injured the employee, and date of injury or diagnosis of illness.
5. Name and address of physician; if hospitalized, name and address of hospital.
6. Date of report, and name and position of person preparing the report.

Posting the Annual Summary

An annual summary of occupational injuries and illnesses must be posted for each establishment no later than February 1 of the year immediately following, and remain posted until at least March 1. The summary must include the year's totals from the OSHA Form #200 and: calendar year covered, company name, establishment name and address, certification signature, title, and date. If no injuries or illnesses occurred, the form must still be posted with zeroes filled in for the totals. Whoever supervises the preparation of the log and summary must certify (by signature) that the annual summary is true and complete. Employers must present or mail a copy of the summary to those employees who do not regularly report to a single establishment.

Retention of Records

All records must remain in the establishment for five years after the year to which they relate. If an establishment changes ownership, the new employer must preserve the records for the remainder of the five-year period.

Location of Records

Records must be maintained at each establishment (workplace). If an employer has more than one establishment, a different set of records must be maintained at each one.

Dispersed Work Locations

Firms engaged in activities which are physically dispersed, such as agriculture, construction, and transportation, are to maintain records of injuries and illnesses at the place where employees report each day. Records for employees such as traveling salespeople and technicians must be maintained either at the base from which they operate or at the place from which they are paid.

Access to Records

Required records must be kept current and be available for inspection and copying at any reasonable time by authorized federal or state government representatives (this includes representatives of the Department of Labor, the Department of Health and Human Services, and states with jurisdiction). The log and summary must also be made available to any employee, former employee, and employee representatives (union officials) for examination and copying.

Reporting Fatalities or Multiple Hospitalization Accidents

Whenever an occupational accident results in a fatality or the hospitalization of five or more employees, the employer must notify the nearest OSHA area office (either by telephone or telegraph) within 48 hours. The report must relate the accident circumstances, number of fatalities, and extent of injuries. More detailed reports also may be required.

Bureau of Labor Statistics
Supplementary Record of
Occupational Injuries and Illnesses

U.S. Department of Labor

This form is required by Public Law 91-598 and must be kept in the establishment for ***5 years.*** **Failure to maintain can result in the issuance of citations and assessment of penalties.**	Case or File No.	Form Approved O.M.B. No. 1220-0029

Employer

1. Name

2. Mail address *(No. and street, city or town, State, and zip code)*

3. Location, if different from mail address

Injured or Ill Employee

4. Name *(First, middle, and last)* Social Security No.

5. Home address *(No. and street, city or town, State, and zip code)*

6. Age 7. Sex: *(Check one)* Male ☐ Female ☐

8. Occupation *(Enter regular job title, not the specific activity he was performing at time of injury.)*

9. Department *(Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)*

The Accident or Exposure to Occupational Illness

If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.

10. Place of accident or exposure *(No. and street, city or town, State, and zip code)*

11. Was place of accident or exposure on employer's premises? Yes ☐ No ☐

12. What was the employee doing when injured? *(Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)*

13. How did the accident occur? *(Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)*

Occupational Injury or Occupational Illness

14. Describe the injury or illness in detail and indicate the part of body affected. *(E.g., amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)*

15. Name the object or substance which directly injured the employee. *(For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.)*

16. Date of injury or initial diagnosis of occupational illness 17. Did employee die? *(Check one)* Yes ☐ No ☐

Other

18. Name and address of physician

19. If hospitalized, name and address of hospital

Date of report	Prepared by	Official position

OSHA No. 101 (Feb. 1981)

Chart 1. Guide to recordability of cases under the Occupational Safety and Health Act

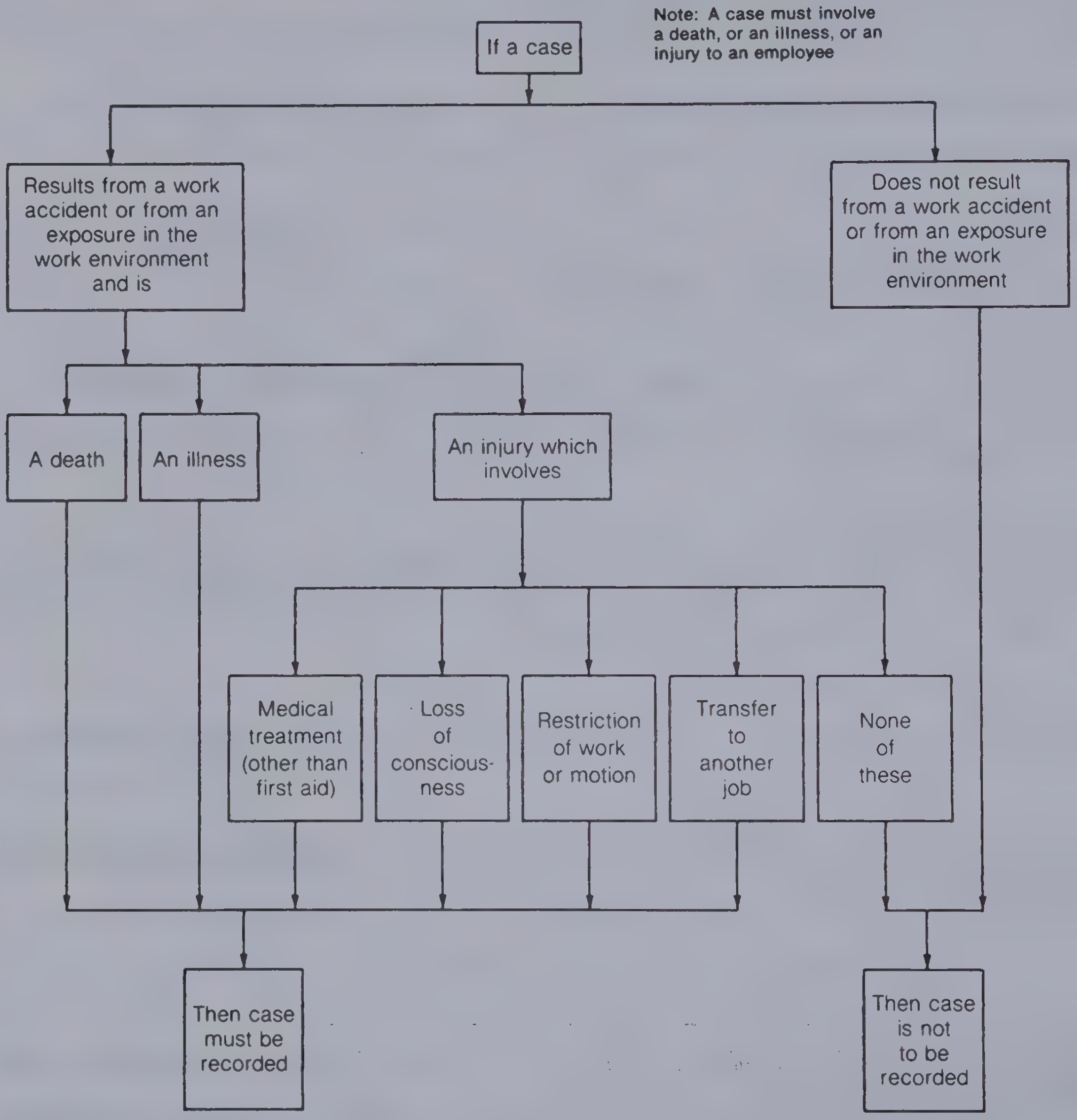
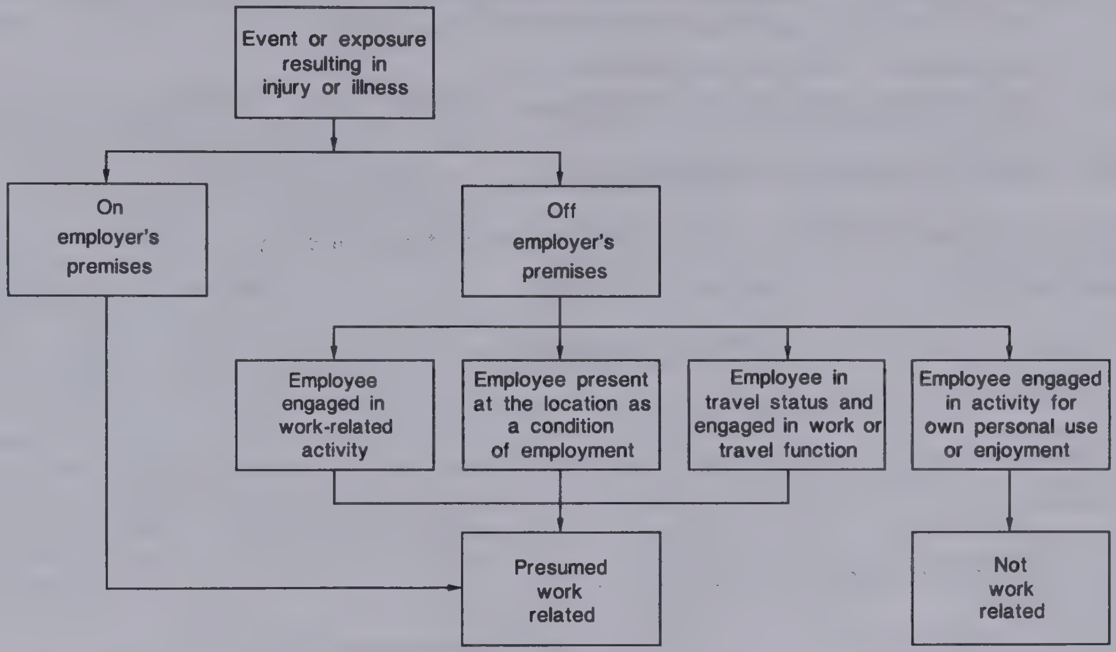

If a case
Note: A case must involve a death, or an illness, or an injury to an employee
Results from a work accident or from an exposure in the work environment and is
Does not result from a work accident or from an exposure in the work environment
A death
An illness
An injury which involves
Medical treatment (other than first aid)
Loss of consciousness
Restriction of work or motion
Transfer to another job
None of these
Then case must be recorded
Then case is not to be recorded

Chart 2. Guidelines for establishing work relationship


Event or exposure resulting in injury or illness
On employer's premises
Off employer's premises
Employee engaged in work-related activity
Employee present at the location as a condition of employment
Employee in travel status and engaged in work or travel function
Employee engaged in activity for own personal use or enjoyment
Presumed work related
Not work related

The Role of the BLS

The Bureau of Labor Statistics is responsible for maintaining the OSHA recordkeeping system and for collecting, compiling, and analyzing work injury and illness statistics. BLS statistics are used for OSHA policymaking. The figure that OSHA uses to target the most hazardous industries for inspection comes from BLS data on general industry manufacturing. The BLS also publishes a guide to OSHA recordkeeping which was revised in April 1986. Single copies of these guidelines, titled "A Brief Guide to Recordkeeping Requirements for Occupational Injuries and Illnesses," are available from:

U.S. Department of Labor
Bureau of Labor Statistics
441 G St. N.W.
Washington D.C. 20212.

Ordering Recordkeeping Forms — Booklets — Posters

OSHA recordkeeping forms, descriptive booklets, and posters which are available without cost, can be obtained from one of the following agencies:

Dept. of Labor, Occupational Safety and Health Administration
Department of Labor, Bureau of Labor Statistics
State statistical grant agency (if there is one in your state)

Refer to your local telephone directory for the addresses of these agencies' area offices.

For your convenience, we suggest you make a photocopy of this form to use as your order form.

ORDER FORM

From: Name ______________________________

Firm ______________________________

Street Address ______________________________

City and State ____________________ Zip __________

Please send me the following items at no charge:

______ Recordkeeping Booklets;

______ Log and Summary Record of Occupational Injuries and Illnesses (OSHA Form 200)

______ Supplementary Record of Occupational Injuries and Illnesses (OSHA Form 101)

______ Poster: Job Safety and Health Protection;

______ Booklet: A Brief Guide to Recordkeeping Requirements for Occupational Injuries and Illnesses

To assist you with prompt, accurate shipping, I have typed or printed the address label below. Please use it in sending my order. Thank you.

Name ______________________________

Firm ______________________________

Street Address ______________________________

City and State ____________________ Zip __________

Definitions applicable to Section 1904, OSHA Regulations for Recording and Reporting Occupational Injuries and Illnesses

Establishment. A single physical location where business is conducted or where services or industrial operations are performed. Where distinctly separate activities are performed at a single physical location, each activity should be treated as a separate establishment.

First aid. Any one time treatment and any follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such one time treatment and followup visit for observation is considered first aid even though provided by a physician or other health care professional.

Lost workdays. The number of days, consecutive or not, after but not including the day of injury or illness during which the employee would have worked but could not do so. This includes an employee's inability to perform all or any part of the normal assignment during all or any part of the workday or shift, because of the occupational injury or illness.

Medical treatment. Treatment other than first aid administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment (one time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

Occupational illness. Any abnormal condition or disorder (other than one resulting from an occupational injury) caused by exposure to environmental factors associated with employment. Included are acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

Occupational injury. Any injury such as a cut, fracture, sprain, amputation, etc which results from a work accident or from an exposure involving a single incident in the work environment. (Note: conditions resulting from animal bites such as insect or snake bites or from one-time exposure to chemicals are considered injuries.)

Recordable occupational injuries or illnesses. Occupational injuries or illnesses which result in:

1. Fatalities, regardless of the length of time between the injury and death, or the length of the illness;
2. Lost workday cases other than fatalities; or
3. Nonfatal cases without lost workdays which result in transfer to another employment or require medical treatment other than first aid, or involve loss of consciousness or restriction of work or motion. This category also includes any diagnosed occupational illnesses which are reported to the employer but are not classified as fatalities or lost workday cases.

RECORDS REQUIRED

Standard, Substance, or Activity	Subpart	OSHA Standard Number	Environmental/personal monitoring records	Exposure(s) records and/or reports	Periodic med. exams/Medical surveillance records	Initial or pre-assignment med. exam record	Periodic maintenance, inspections, tests, records or certification	Current material inventory, MSDSs	Written compliance program, training materials, & instructions, job hazards, safe work practices	Emergency plans/maintenance manuals	Respirator program	Operations/incidence reports to OSHA
2-Acetylaminofluorene	Z	1910.1014			X	X		X	X	X	X	X
Acrylonitrile	Z	1910.1045	X	X	X	X		X	X	X	X	
alpha-Naphthylamine	Z	1910.1004			X	X		X	X	X	X	X
4-Aminodiphenyl	Z	1910.1011			X	X		X	X	X	X	X
Arsenic — inorganic	Z	1910.1018	X	X	X	X		X	X	X	X	
Asbestos, tremolite, actirolite & anthophyllite	Z	1910.1001	X	X	X	X		X*	X	X	X	
Benzidine	Z	1910.1010			X	X		X	X	X	X	X
beta-Naphthylamine	Z	1910.1009			X	X		X	X	X	X	X
beta-Propiolactone	Z	1910.1013			X	X		X	X	X	X	X
bis-Chloromethyl Ether	Z	1910.1008			X	X		X	X	X	X	X
Coke oven emissions	Z	1910.1029	X	X	X	X		X	X	X	X	
Cotton dust	Z	1910.1043	X	X	X	X		X	X		X	
Cranes — crawler, locomotive, and truck	N	1910.180					X					
Cranes — overhead and gantry	N	1910.179					X					
Derricks	N	1910.181					X					
3,3'Dichlorobenzidine and its salts	Z	1910.1007			X	X		X	X	X	X	X
1,2-Dibromo-3-Chloropropane	Z	1910.1044	X	X	X	X		X	X	X	X	
4-Dimethylaminoazobenzene	Z	1910.1015			X	X		X	X	X	X	X
Diving, commercial	T T	1910.420 1910.430					X		X	X		
Ethyleneimine	Z	1910.1012			X	X		X	X	X	X	X
Ethylene oxide (EtO)	Z	1910.1047	X	X	X	X		X*	X	X	X	
Fire Brigades	L	1910.156							X		X	
Fire extinguishing systems, fixed	L	1910.160					X			X		
Fire extinguishers, portable	L	1910.157					X			X		
Fire detection systems	L	1910.164								X		
Flammable & combustible liquids	H	1910.106								X		

*MSDSs are specifically mentioned in this standard; however, according to the hazard communication standard, all other hazardous materials must also have MSDSs on record.

RECORDS REQUIRED

Standard, Substance, or Activity	Subpart	OSHA Standard Number	Environmental/personal monitoring records	Exposure(s) records and/or reports	Periodic med. exams/Medical surveillance records	Initial or pre-assignment med. exam record	Periodic maintenance, inspections, tests, records or certification	Current material inventory, MSDSs	Written compliance program, training materials, & instructions, job hazards, safe work practices	Emergency plans/maintenance manuals	Respirator program	Operations/incidence reports to OSHA
Forging machines	O	1910.218					X					
Hazard communication	Z	1910.1200						X	X	X		
Hazardous waste operations and emergency response	H	1910.120	X	X	X	X		X	X	X	X	
Helicopters	N	1910.183						X				
Ionizing radiation	G	1910.96	X	X					X			X
Laundry machine operations	R	1910.264							X			
Lead	Z	1910.1025	X	X	X	X		X	X		X	
Manlifts	F	1910.68					X					
Mechanical power presses	O	1910.217					X					
Methyl chloromethyl ether	Z	1910.1006			X	X		X	X	X	X	X
4-Nitrobiphenyl	Z	1910.1003			X	X		X	X	X	X	X
N-Nitrosodimethylamine	Z	1910.1016			X	X		X	X	X	X	X
Occupational noise exposure	G	1910.95	X	X	X	X			X			
Powered platforms	F	1910.66					X					
Respiratory protection	I	1910.134					X		X		X	
Servicing multi-piece and single-piece rim wheels	N	1910.177								X		
Slings	N	1910.184					X					
Telecommunications	R	1910.268					X		X			
Vinyl chloride	Z	1910.1017	X	X	X	X		X	X	X	X	X
Welding, cutting and brazing	Q	1910.252					X		X			
Wiring design and protection	S	1910.304					X		X			

OTHER WRITTEN RECORDS REQUIRED BY OSHA

OSHA requires certain employers to keep other records besides injury and illness records. These are outlined in the chart (Quick Reference — OSHA Records Checklist) on the previous page. Once again, paperwork reductions have resulted in many employers being exempted from keeping the detailed records once required. The chart covers those records specifically mentioned in the standards; however, even when recordkeepingis not specifically required, it is always best to document everything possible. For example, the standard for powered industrial trucks requires that daily (or even every shift) inspections be made of trucks and equipment, but does not specifically mention that a record of these inspections must be kept. Of course, prudent employers would keep an inspection record in order to prove that the inspections were indeed conducted.

Employee Exposure and Medical Records

Employee exposure and medical records must be kept mainly for employees who are exposed to harmful substances or noise in the workplace. OSHA may at times require access to these records, but is careful to ensure the privacy of the individuals whose records are personally identifiable. Medical exposure records must also be released upon request to the director of the National Institute for Occupational Safety and Health (NIOSH).

Employee exposure and medical records must be made available upon request to employees within a reasonable time (no more than 15 days after the request). Access to employee records must also be provided to employee representatives, except in the case of medical records, where the written consent of the employee is required.

Upon initial hiring and at least annually thereafter, employers must inform employees exposed to toxic substances or harmful physical agents of the existence, location, and availability of records; the person responsible for maintaining and providing access to the records; and each employee's rights of access to the records.

Exposure records and data analysis must be maintained for 30 years, and medical records for the duration of employment plus 30 years (except where noted otherwise in a specific standard). When an employer ceases to do business, the records must be passed on to and maintained by the successor employer. If there is no successor, the employer must notify affected employees three months before the cessation of business. These records must then be transferred to NIOSH or the employer must notify NIOSH three months before disposing of the records.

Fire Protection and Emergency Action Plans

Under certain conditions employers are required to have a written emergency action plan and an emergency fire prevention plan. These requirements are covered in Subpart E — Means of Egress 1910.38, and Subpart L — Fire Protection 1910.156 and .157.

Respiratory Protection

Written procedures covering the selection, use, and safe use of respirators in dangerous atmospheres must be developed. For respirators maintained for emergency use, a record must be kept of the monthly inspections and findings.

Commercial Diving

A record must be kept of any diving-related injury or illness resulting in the hospitalization of a dive team member for 24 hours or more. The record must specify the circumstances of the incident and the extent of the injury or illness.

Exemptions

Whenever a company is exempted from OSHA recordkeeping regulations, it should maintain records including the relevant objective data which justifies the exemption. For example, a company who can prove that asbestos cannot be released in dangerous concentrations under the expected processing conditions can be exempted from monitoring and medical surveillance requirements of the asbestos standard if it retains the data that supports the exemption.

Certification vs. Recordkeeping

A rule allowing certifications to replace detailed records of equipment and material maintenance was passed in 1986. While the regular maintenance tests and inspections must still be conducted, employers may now prepare a certification record by listing: the date the inspection or test was performed, the signature of the person conducting the test, and the identity of the equipment tested. Certifications can replace recordkeeping requirements in tests and inspections of:

manlifts [1910.68(e)(3)];

portable fire extinguishers [1910.157];

crane hooks, hoist chains, brakes and ropes [1910.179(j)(2)(iii-iv), 1910.179(m)(1-2), 1910.180(d)(6), 1910.180(g)(1-2), 1910.181(g)(1 and 3)];

mechanical power press safeguards, clutches and brakes [1910.217(e)(1)(i-ii)];

forging machine guards and point of operation protection devices [1910.218(a)(2)(i-ii)];

welding, cutting, and brazing equipment [1910.252(c)(6)].

On the following pages are suggested forms you may use or adapt for your records:

Office Area Safety Inspection

Accident Report (internal - does not replace OSHA #200 or #101)

Authorization for Physician's Services

Air Sampling Data

Fire Extinguisher Inspections

Mechanical Power Press Records (should you choose not to use the OSHA certification procedure)

OFFICE AREA SAFETY INSPECTION CHECKLIST

LOCATION:	INSPECTION DATE:
SUPERVISOR:	FOLLOW-UP DATE:
INSPECTED BY:	INSPECTION PERIODS: Weekly ☐ Monthly ☐ Quarterly ☐

NOTE: This is a condensed checklist for quick reference use. Refer to the OSHA REFERENCE MANUAL for more detailed requirements.

O.K. ✓	DESCRIPTION	X	Corrective Action Needed (Comments)	Date Corrected	By
	WALKING SURFACES				
	Aisles correctly established and clear				
	No tripping hazards in evidence				
	Floor(s) even (no holes or cracks)				
	Wires not stretched across aisles				
	Entrance mats available, used for wet weather				
	Floors dry — not slippery				
	Carpets and rugs secure				
	Outside walkways, parking areas in good repair				
	STAIRWAYS, HALLS, RAMPS, STORAGE AREAS				
	Adequate lighting suitable for work to be done				
	Ramps have non-slip surface				
	Stairways clear — not cluttered				
	Stair treads in good condition				
	Handrails installed and in good condition				
	Guardrails installed and in good condition				
	Halls kept clear of equipment and supplies				
	BOOKCASES, SHELVES, CABINETS				
	Shelves not overloaded				
	Heavy storage shelves secured to wall				
	Heavy storage files secured from tipping				
	Bookcases secured from tipping				
	OFFICE EQUIPMENT, DUPLICATING MACHINES, TOOLS				
	File cabinets secure				
	File drawers closed when not in use				
	File drawers not overstuffed				
	Chairs (springs, casters) in good mechanical condition				
	Fans guarded, secure from falling or tipping				
	Paper cutter equipped with guard; blade spring functioning				
	Paper shredder guarded				
	Safe step stools used when needed (non-rolling type)				
	Step stools kept clear of aisleways when not in use				
	Sufficient ventilation where required				

(Continued other side)

OFFICE AREA SAFETY INSPECTION CHECKLIST (Continued)

INSPECTION DATE:

OFFICE EQUIPMENT, DUPLICATING MACHINES, TOOLS (Continued)

O.K. ✓	DESCRIPTION	X	Corrective Action Needed (Comments)	Date Corrected	By
	Spirit duplicating liquid properly stored				
	"No smoking" sign near spirit duplicating machines and no-smoking rule enforced				
	Paper, supplies, material safely stacked				
	Knives, scissors, other sharp tools used/stored correctly				
	Emptied containers of solvents, duplicating machine liquids properly disposed of				

ELECTRIC HAZARDS

O.K. ✓	DESCRIPTION	X	Corrective Action Needed (Comments)	Date Corrected	By
	Machines and equipment grounded				
	Extension cords – 3-wire type				
	Extension cords – maximum length 10 feet				
	Condition of power cords (not patched or spliced)				
	Condition of plugs and wall outlets				
	Electric switch panels clear (at least 30" open area)				
	Circuits not overloaded				
	Management-approved use of coffee pots – (used in controlled locations only)				
	No wires under carpets				
	Electric heaters grounded				
	Management-approved use of electric heaters				
	Portable power tools equipped with guards (See P-01)				

FIRE PREVENTION (See Subpart L in Self-Inspection Checklist, also Page J-07 of Subpart J)

O.K. ✓	DESCRIPTION	X	Corrective Action Needed (Comments)	Date Corrected	By
	Fire extinguishers properly marked and installed				
	Fire extinguisher has current inspection tag				
	Fire extinguisher not blocked or obstructed				
	Fire escapes clear				
	Fire doors not blocked open				
	Approved ashtrays in use				
	No-smoking areas established as needed				
	Exits properly marked				
	Sprinkler heads not blocked				
	Excess paper and trash removed				

SANITATION, WATER SUPPLY, PERSONAL PROTECTION

(See also Subpart J of Self-Inspection Checklist, Pages J-01 thru J-03)

O.K. ✓	DESCRIPTION	X	Corrective Action Needed (Comments)	Date Corrected	By
	Drinking water available				
	Condition of toilet facilities				
	Personal protective devices available if needed (Subpart I 1910.132)				
	Condition of approved eating areas (See 1910.141(g) Page J-03)				
	Food scraps, peels, wrappings disposed of daily				
	First-aid supplies available				
	All required notices posted				

REPORT OF ACCIDENT

To be completed for all accidents, even if no injury was sustained.

1. Date and time of accident ____________________ ______ AM ______ PM
2. Location of accident (Area / Dept.) ____________________
3. Equipment involved ____________________
4. Employee(s) involved:

NAME	AGE	JOB Classification	IF INJURED	
			First Aid Given	Med Att'n Needed

5. First aid administered by: ____________________
6. Medical attention authorized by: ____________________
7. Who witnessed accident? ____________________
8. Describe accident and nature of injury, if any: ____________________
9. What happened? ____________________
10. How did it happen? ____________________
11. What unsafe act was committed? ____________________
12. List any unsafe conditions which contributed to accident / injury:

    ☐ Complete check-list of possible causes on other side
13. Could this accident have been prevented? Explain:
14. What should be done to prevent similar accidents?
15. Responsibility for this accident: ☐ Employee ____________________

    (Explain reason) ☐ Supervision ____________________

    ☐ ____________________
16. Additional investigation ☐ is needed ☐ is not needed

Date of report ____________________ Prepared by ____________________

Supervisor ____________________

☐ First aid only required, non-recordable injury

☐ Medical treatment required / physician to indicate if injury is recordable

☐ Recordable injury; enter on OSHA Forms 200 and 101. File or Log No. ____________________

ANALYSIS OF FACTORS CONTRIBUTING TO CAUSE OF ACCIDENT

WORKING CONDITIONS

☐ Poor housekeeping
☐ Poor ventilation
☐ Poor lighting
☐ Temperature (____Hot /____ Cold)
☐ ____________________
☐ ____________________

BUILDING / PLANT CONDITION

☐ Fire protection inadequate
☐ Exits unmarked
☐ Exits blocked
☐ Unguarded floor opening
☐ ____________________
☐ ____________________

EQUIPMENT / MACHINERY

☐ Faulty tools
☐ Faulty machinery
☐ Lack of maintenance
☐ Improper guarding
☐ Guards removed
☐ Guards missing
☐ Guards tampered with
☐ ____________________
☐ ____________________
☐ ____________________

EMPLOYEE(S) CONDITION / ATTITUDE

☐ Inexperienced
☐ Insufficient training / instructions
☐ Instructions disregarded
☐ Instructions not enforced
☐ Unskilled
☐ Ignorant
☐ Used poor judgement
☐ ____________________

ATTITUDE / DISCIPLINE

☐ Disobeyed rules
☐ Attention distracted
☐ Inattentive
☐ Fooling, horseplay
☐ Attempted shortcuts
☐ Was hasty
☐ Did not follow safe practice procedure

PHYSICAL / MENTAL CONDITION

☐ Fatigued
☐ Sluggish
☐ Weak
☐ Sick
☐ Disturbed
☐ Personal problems
☐ Drunk, drug abuse
☐ ____________________
☐ ____________________

DRESS / SAFETY EQUIPMENT

☐ Protective wear not used
☐ Protective wear not available
☐ Safety equipment not used
☐ Safety equipment not readily available
☐ ____________________
☐ ____________________
☐ Clothing loose or too long
☐ Failure to wear safety shoes
☐ Faulty shoes, high heels
☐ ____________________

Employee's Statement: ____
____
____

Employee's Signature ____________________

Witness' Statement: ____
____

Witness' Signature ____________________

Supervisor's or investigator's remarks: ____
____
____
____
____
____
____

Use additional sheets , if needed, for statements from involved employees or witnesses.

AUTHORIZATION FOR PHYSICIAN'S SERVICES

Company ____________________________________

____

____

SUPERVISOR: Complete this section, sign as indicated, and send Original and two copies to doctor with injured employee.

Injured Employee ____________________ Job Title __________

Date of Accident ________________ Time ____ AM ____ PM ____ Shift

Where did accident happen? ________________________

How did accident happen? ________________________

____

Probable / Suspected injury ________________________

First aid administered? ________________ By whom? __________

Examination and/or treatment authorized by ____________________

Supervisor signature

EMPLOYEE: It is your responsibility to make certain that the original and one copy of this form is returned to your supervisor immediately after completion by physician.

PHYSICIAN: Please fill out this section completely. Retain one copy for your records, and return the original and a copy to us by the patient or attendant.

Arrived for Treatment; Date __________ Time __________

Extent of injury ________________________

____

Treatment given ________________________

Your recommendation:

☐ Employee can return to regular work

☐ Employee can return to light duty work (comment) ________________

____

Lost time ________ days

Employee's return to doctor ______ days

Other Comments: ________________________

____

☐ Non-recordable injury, first aid treatment only

☐ Recordable injury

RECOMMENDED DISTRIBUTION: Original — Company file; Employee's personnel file; Physician's copy; Employee's copy; Supervisor's record copy.

AIR SAMPLING DATA

FACILITY / PLANT ______________________ DATE ____________

ADDRESS ______________________ CALIBRATION / DEVICE / METHOD ____________

______________________ BY ____________

(1) SAMPLE NO	(2) SAMPLE MEDIUM	(3) PUMP NO	(4) FLOW RATE (Lpm)		(5) START TIME	(6) STOP TIME	(7) TOTAL MINUTES	(8) TOTAL VOL (L)	(9) LOCATION – DESCRIPTION – REMARKS
			START	STOP					

(1) Enter above: Field or Lab No.
(2) Enter filter type, tube type, impinger & solution, etc.

(9) Brief notation of: Breathing zone (personal) sample; employee name, etc.
Area sample — Equipment used, work done, conditions observed, etc.

SUGGESTED METHOD FOR USE OF FIRE EXTINGUISHER INSPECTION LOG

Enter serial number or identification numbers and locations for each of the fire extinguishers in your facility on log on other side. Be sure to enter month inspection is to cover, and date on which the completed inspection report is to be returned.

MONTHLY FIRE EXTINGUISHER INSPECTION GUIDE*

Page L-06 starts the checklists of standards that begin with number 1910.157. The quick checklist below and the suggested records form on the next page is intended to help you meet requirements for monthly inspections. You may want to duplicate the form and the checklist guide for use by individual departments or supervisors. Such a procedure can help make certain that the equipment is being properly maintained, that each extinguisher is in its designated place, that it has not been activated or tampered with, and to detect any obvious physical damage, corrosion, or other impairment.

Each extinguisher should be inspected for the following:

	YES	NO
1. Is the extinguisher clean and well cared for?		
2. Has the extinguisher been charged and hydrostatically tested within the prescribed periods, and tagged to show the dates?		
3. Is the required seal intact?		
4. Is the discharge orifice clear and unobstructed?		
5. Is there indication that the cap, if any, may be crossthreaded on the collar or that threads are corroded?		
6. Is the shell of the extinguisher corroded, damaged, or dented in such a way as to suggest possible weakness?		
7. Are connections between the hose and the shell and nozzle secure?		
8. If the extinguisher is a pump-operated type, does the pump shaft operate freely?		
9. Is the location of the extinguisher readily accessible and plainly indicated so as to be visible at a distance?		

	YES	NO
10. Is the extinguisher mounted at a convenient height?		
11. If of a type subject to freezing, is the extinguisher protected?		
12. Is the hanger fastened solidly so that the extinguisher is well supported?		
13. Is the extinguisher located too close to the hazard which it is to protect, so that it could not be reached in case of fire?		
14. Are employees in the area familiar with the operation and limitations of the extinguisher?		

Any extinguisher showing defects shall be given a complete maintenance check.

---

*See 1910.157 to determine if you are required to provide and maintain portable fire extinguishers.

MONTHLY FIRE EXTINGUISHER INSPECTION LOG

nth: ______________________________ **Complete and Return by:** ____________________

XTINGUISHER NUMBER	TYPE	LOCATION	LAST DATE SHOWN ON INSPECTION TAG	INSPECTED BY (INITIAL/DATE)	CONDITION/COMMENT (ACTION REQUIRED)

nature ____
(Supervisor or Safety Director)

Press Equip. No.__________ Location__________

Press Model__________ Make__________ Serial No.__________

Tonnage__________ Installation Date__________

Aux. Equip: Feed__________ Scrap Shear__________ Reel__________ Cradle__________

Straightener__________ Stock Oiler__________ Other__________

Type of Point of Operation Guarding: __________

EQUIPMENT-OPERATION / CHECK POINTS INSPECTION RECORD DATE__________

	CHECKPOINT/CONDITION	Yes	No	OK Date	Maint Req'd	Date Repaired	Shop Ord No	Action Take or Comments
1	FRAME							
	Cracked							
	Broken							
	Loose Tierods							
	Loose Brackets or Components							
2	LEGS							
	Cracked							
	Secure to Frame							
3	POINT OF OPERATION							
	Guards in Place & Secure							
	Adjusted Properly							
	Devices Being Used Properly							
	Devices Adjusted Properly							
	Hand Tools Being Used if Required							
4	KNOCKOUT BAR							
	Proper Adjustment							
	Broken Brackets							
	Bent Adjusting Screws							
	Bent Bar							
	Brackets Secure							
5	AIR PRESSURE SETTING							
	Proper Pressure							
6	COVERS							
	Flywheel — In Place & Secure							
	Gear — In Place & Secure							
	Clutch — In Place & Secure							
	Brake — In Place & Secure							
	Feed & Scrap Shear in Place							
	Others — In Place & Secure							

(continued next

EQUIPMENT-OPERATION / CHECK POINTS INSPECTION RECORD
(continued)

DATE____________________

	CHECKPOINT/CONDITION	Yes	No	OK Date	Maint Req'd	Date Repaired	Shop Ord No	Action Taken or Comments
7	FULL ROTATION CLUTCH							
	Engaging & Disengaging Properly							
	Tripping Mechanism Shielded							
	Proper Lubrication							
8	AIR CLUTCH							
	Engaging & Disengaging Properly							
	Lining Wear							
	Proper Air Pressure							
	Air Line Filter Clean							
	Clutch Properly Lubricated							
	Surge Tank Drained							
9	BRAKE							
	Lining Wear							
	Properly Adjusted							
	Proper Air Pressure							
10	SLIDE COUNTERBALANCE							
	(Spring Type) Broken							
	Properly Adjusted							
	(Air Type) Broken							
	Proper Air Pressure to Balance							
	Slide & Die							
	Proper Lubrication							
	Surge Tanks Drained							
11	CONTROLS							
	Functioning Properly							
	Controls Being Used Properly							
	Controls Set Properly for Operation							
	All Electrical Covers in Place							
	Any Unprotected Wires							
	Proper Fusing							
	Air Pressure Switches							
12	LUBRICATION							
	Lubricator Functioning Properly							
	Press Lubricator Properly (Visual)							
	Proper Oil Level in Slide Adjustment							
	Oil or Grease in Reservoir							
	Broken or Leaking Lines or Fittings							
13	BEARINGS							
	Main — Clearance							
	Connection — Clearance							
	Wrist or Ball — Clearance							
	Total Clearance of Slide Assembly							
	Anti Friction — Properly Lubricated							
	Anti Friction — Loose or Worn							
	Slide Ways & Gibs Adjusted Properly							

(continued next page)

EQUIPMENT-OPERATION / CHECK POINTS INSPECTION RECORD *(continued)*

DATE____________________

	CHECKPOINT/CONDITION	Yes	No	OK Date	Maint Req'd	Date Repaired	Shop Ord No	Action Taken or Comments
14	GEARS							
	Proper Lubrication							
	Check for Uneven Wear							
	(Bent Crankshaft)							
	Loose on Shaft							
	Cracks or Broken Teeth							
15	FLYWHEEL – SHEAVE & BELTS							
	Flywheel Loose on Shaft							
	Sheave Grooves Aligned With							
	Flywheel Grooves							
	Belt Wear							
	Proper Belt Tension							
16	MOTOR							
	Secured to Bracket							
	Bracket Secure to Press							
	Motor Bracket Hinge Pin Wear							
	Adjusting Mechanism Secure							
	Exposed Wires							
17	OVERLOAD							
	Does Press Appear Overloaded							
	Further Inspection Required							
18	AIR BLOW OFF							
	Hoses & Fittings							
	Proper Adjustment							
19	PNEUMATIC CUSHION							
	Air Controls Adjusted Properly							
	Lines & Fittings							
20	CLEAR OF SCRAP & DEBRIS							
	Well Lighted							
	Oil Splatter							
	Noise Level							
21	LEVEL							
	Press Level							
	All Press Pads Contacting							
	Floor							

INSPECTOR'S SIGNATURE ____________________

DATE____________________

EMERGENCY REPORTS

A written or oral report *must* be filed within 48 hours of any accident which occurs at any place of employment and:

a. is fatal to one or more employees, or

b. requires hospitalization of five or more employees.

HOW TO MAKE THE REPORT:

The report shall relate the circumstances of the accident, the number of fatalities, if any, and the extent of the injuries. The Area Director may request a further report, in writing, concerning details of the accident.

You may report by telephone or telegraph to the nearest Area Director of the U.S. Department of Labor, Occupational Safety and Health Administration. See Section I (white tab, Volume 2) for a listing of regional and area OSHA offices. If your state has its own plan in effect, you should check for additional reporting requirements you may have to comply with.*

**If your state has a plan in effect, we recommend that you check with the appropriate state agency for details on their reporting requirements and add notes on such requirements on this page for your future reference.*

STEP 4: SELF-INSPECTION PROGRAM

A member of your establishment should periodically inspect all of your facilities to see that the requirements of OSHA are being met. A checklist is provided on the following pages to be used during this self-inspection.

Through inspections by the authors of this manual of many business and industrial firms, a number of violations have been found to be prevalent. These most-noted violations are listed below:

Electrical

(a) Ungrounded equipment (shop tools, portable power tools, fans and lighting systems).

(b) Broken ground leads on electrical leads; open switch and junction boxes; frayed and spliced cords.

(c) Lack of dead man switches on hand and portable power tools and other hand-held equipment. Compressed air has been found to be discharging at over 30 psi on some pieces of equipment.

Fire Protection

(a) Fire extinguishers of improper type; often not tagged or properly marked.

(b) Too few fire extinguishers per square foot of space.

(c) Lack of automatic sprinklers in storage areas.

General Environmental Controls

Toilet facilities not properly vented.

Hazardous Materials

Paint spraying without paint booths.

Housekeeping

Floors not painted to identify aisles and exits. Work areas and aisles cluttered.

Machine Guarding

Rollers, gears, pulleys, belts, and grinders not properly guarded.

Material Handling and Storage

(a) Fork trucks not equipped with overhead guard roll over bars.

(b) Storage of material not secure.

Means of Egress

Exits not clearly marked.

Exits not adequate by number.

General Duty Violations

Use of electric truck in lieu of proper platform.

Employee owned equipment defective.

Personal Protective Equipment

(a) Lack of mandatory requirements for wearing safety glasses and hard hats.

(b) Goggles not available at bench grinder.

(c) Hard hat not worn on job when overhead hazard exists (such as material piled higher than seven feet).

Signs and Written Records

Required signs not posted; no written records.

Walking and Working Surfaces

(a) Access to overhead storage not available by fixed ladder or stairs with proper handrails.

(b) Lack of railings and toe boards.

(c) Lack of railings on loading docks.

(d) Lack of color coding and warning signs for low overhead storage.

(e) Missing rungs and feet on ladders.

(f) Oily rags not in metal containers with lids.

Welding and Cutting

Gas bottles not secured; safety caps missing.

Gas bottles not chained down and stored upright.

INTRODUCTION TO SELF-INSPECTION CHECKLIST

The checklist was developed by going through the General Industry Standards (29 CFR 1910) published in the Federal Register, item by item, and ''breaking out'' all of the requirements of each item in question form. For the purpose of this checklist, referring to the tables and figures reproduced in the Self-Inspection Appendix will serve your needs. The Appendix is located at the end of each Subpart. The tables and figures are arranged in numerical order within each subgroup. The Federal Register page number, if shown, is an added reference. Please note, that depending on the issue date of the Federal Register you may be using, the specific page numbers may not agree.

As an example, 1910.1200(g) reads as follows in the Federal Register:

> (g) *Material safety data sheets.* (1) Chemical manufacturers and importers shall obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Employers shall have a material safety data sheet for each hazardous chemical which they use.
> (2) Each material safety data sheet shall be in English and shall contain at least the following information:

References to Figures and Tables
Figures and tables from the Federal Register have been reproduced for your convenience and appear in the Appendix to Self-Inspection Section. They are arranged in numerical sequence within each subpart grouping. Only those Figures and Tables referenced in the checklist are included.

In the checklist, the item reads as follows:

	YES	NO
1910.1200 — MATERIAL SAFETY DATA SHEETS		
Is there a material safety data sheet for each hazardous chemical used the workplace? **(g)(1)**	☐	☐
Is the material safety data sheet in English, and does it contain at least the following . . . **(g)(2)**	☐	☐
1910.109 EXPLOSIVES AND BLASTING AGENTS		
Is Table H-21 (see Appendix) used for proper storage of explosives? **(c)(1)(6)**	☐	☐
1910.110 STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GAS		
Is Table H-24 (see Appendix) used in determining the minimum nominal wall thickness of copper tubing? **(b)(8)(2)**	☐	☐

The page numbers of the checklist are keyed to the Alpha designation (letters) of the Subparts of the standards. For example, all page numbers in Subpart D begin with the letter D (D-01, D-02, D-03, etc.), Subpart E (E-01, E-02, E-03, etc.)

FACILITIES PLAN

We recommend that you prepare a facilities plan of your overall plant or building, plus detailed plans for each department or subdivision. The overall plan will let you see at a glance the arrangements of aisles, exits, storage areas, etc. The facilities plan can help you determine the best locations for first aid material, fire extinguishers, emergency exits, and recommended routes of travel should an emergency arise. It can also be used to flag the locations of power and utility shut-off switches or valves.

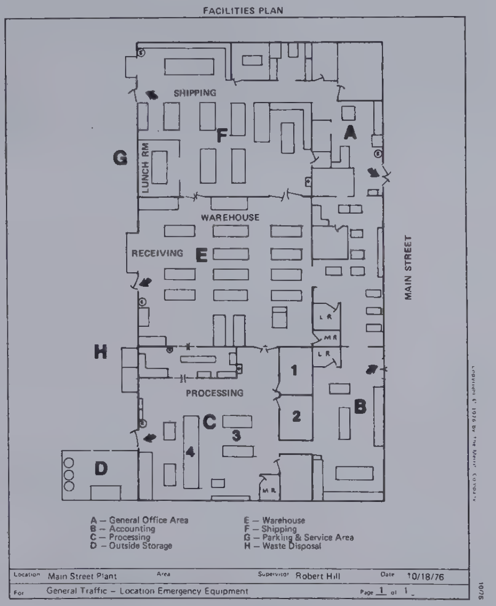
A further recommendation, if you plan periodic self-inspection programs, would be to divide your facility into "inspection sections." In such instances you can prepare, in advance, the different area plans to be used by the supervisory or inspecting personnel in conducting the inspections. You may want to point out certain problem areas or hazards they are to look for. The plans can also serve for the "inspecting employee" to make notations of any problem or hazard found during the inspection he or she may want to call to your attention.

On the following pages we provide master plan sheets, with and without grid patterns, which you can either mark directly or can use to make photocopies as needed.

The list below will serve as a guide to some of the items you may want to include on your facilities plans. We also suggest a few ways you can use facilities plan sheets in your OSHA compliance programs.

YOU SHOULD SHOW:

1. Aisles and passageways
2. Access and egress locations
3. Traffic flow plan for evacuation
4. Fire extinguisher locations
5. Hazardous areas – personal protective devices required
6. Areas requiring machine guarding
7. Areas requiring special safety devices
8. Storage areas requiring segregation of hazardous material
9. Areas requiring ventilation and atmospheric controls
10. Regulated areas – clean rooms – change rooms
11. Location of emergency supplies, equipment, first aid material
12. Emergency treatment locations
13. Emergency alarm locations
14. Location of master switches, valves, controls



FACILITIES PLAN

A – General Office Area
B – Accounting
C – Processing
D – Outside Storage
E – Warehouse
F – Shipping
G – Parking & Service Area
H – Waste Disposal

Location Main Street Plant Area Supervisor Robert Hill Date 10/18/76
For General Traffic – Location Emergency Equipment Page 1 of 1
10/76

USE THE FACILITIES PLAN SHEETS FOR:

1. Maintenance and inspection scheduling – indicate route to be followed, key points to be covered
2. Job hazard analysis to seek out any accident-contributing conditions that may exist
3. Illumination surveys
4. Noise-level monitoring, surveys
5. Assignment of sectors and duties for emergency situations

Location Area Supervisor Date

For: Page _____ of _____

INSPECTION REPORT / FOLLOWUP RECORD

Enter description of equipment component or facility requiring repair or maintenance

Location	Equipment/Facility	Inspected By:	Date

Item No.	Component / Checkpoint	OSHA Standard No. (if any)	Repairs, Corrections, Maintenance Required or Recommended	Shop Order No.	Date Repaired or Serviced	Additional Action / Comments

Page of

YES	NO

YES	NO

SELF-INSPECTION ACTION FORM

OPERATION / CONDITION	Yes	No	Action Taken	Date

OVERVIEW: SUBPART A

GENERAL INFORMATION

This section, 1910.1 through 1910.6 was originally drafted to set the legal stage for adopting certain consensus standards which would incorporate into the Occupational Safety and Health Act of 1970 recognized federal standards and certain recognized national consensus standards. The United States Congress authorized the Assistant Secretary of Labor for Occupational Safety and Health to promulgate standards as rapidly as possible, beginning with passage of the OSH Act, and within a two-year period. Existing consensus standards were recognized as generally acceptable in the industrial setting.

The terminology of the word "standard" as defined in the legislation is significant. An OSHA "standard" requires conditions, or the adoption or use of practices, means, methods, operations, or processes considered to be reasonably necessary or appropriate to provide safe or healthful employment and places of employment.

Congress, in its wisdom, recognized the impossibility of addressing every conceivable condition, and established as part of the OSH Act, the "General Duty Clause," section 5(a)1, which is recognized as a catch-all requirement for safe work conditions and practices. In actual practice, OSHA can invoke the General Duty Clause only in the absence of a specific standard for a cited condition or alleged violation.

YES NO

This portion of the Manual, items 1910.1 through 1910.6, is informational as to the authority and source for adoption of consenus standards, the development of standards, and their application to particular employers and places of employment.

1910.1 — PURPOSE AND SCOPE

(a) Section 6(a) of the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1593) provides that "without regard to chapter 5 of title 5, United States Code, or to the other subsections of this section, the Secretary shall, as soon as practicable during the period beginning with the effective date of this Act and ending 2 years after such date, by rule promulgate as an occupational safety or health standard any national consensus standard, and any established federal standard, unless he determines that the promulgation of such a standard would not result in improved safety or health for specifically designated employees." The legislative purpose of this provision is to establish, as rapidly as possible, standards with which industries are generally familiar, and on whose adoption interested and affected persons have already had an opportunity to express their views. Such standards are either:

(1) National concensus standards on whose adoption affected persons have reached substantial agreement, or

(2) Federal standards already established by federal statutes or regulations.

(b) This part carries out the directive to the Secretary of Labor under section 6(a) of the Act. It contains occupational safety and health standards which have been found to be national consensus standards or established federal standards.

1910.2 — DEFINITIONS

As used in this part, unless the context clearly requires otherwise:

(a) "Act" means the Williams-Steiger Occupational Safety and Health Act of 1970 (84 Stat. 1590).

(b) "Assistant Secretary of Labor" means the Assistant Secretary of Labor for Occupational Safety and Health;

(c) "Employer" means a person engaged in a business affecting commerce who has employees, but does not include the United States or any State or political subdivision of a State;

(d) "Employee" means an employee of an employer who is employed in a business which affects commerce;

(e) "Commerce" means trade, traffic, commerce, transportation, or communication among the several States, or between a State and any place outside thereof, or within the District of Columbia, or a possession of the United States (other than the Trust Territory of the Pacific Islands), or between points in the same State but through a point outside thereof;

(f) "Standard" means a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment;

YES NO

1910.3 – PETITIONS FOR ISSUANCE, OR REPEAL OF A STANDARD

(g) "National consensus standard" means any standard or modification thereof which:

(1) has been adopted and promulgated by a nationally recognized standards-producing organization under procedures whereby it can be determined by the Secretary of Labor or by the Assistant Secretary of Labor that persons interested and affected by the scope or provisions of the standard have reached substantial agreement on its adoption,

(2) was formulated in a manner which afforded an opportunity for diverse views to be considered, and

(3) has been designated as such a standard by the Secretary or the Assistant Secretary, after consultation with other appropriate federal agencies; and

(h) "Established Federal standard" means any operative standard established by any agency of the United States and in effect on April 18, 1971, or contained in any Act of Congress in force on the date of enactment of the Williams-Steiger Occupational Safety and Health Act.

1910.3 — PETITIONS FOR ISSUANCE, AMENDMENT, OR REPEAL OF A STANDARD

(a) Any interested person may petition in writing the Assistant Secretary of Labor to promulgate, modify, or revoke a standard.

The petition should set forth the terms or the substance of the rule desired, the effects thereof if promulgated and the reasons therefor.

(b)

(1) The relevant legislative history of the Act indicates congressional recognition of the American National Standards Institute and the National Fire Protection Association as the major sources of national consensus standards. National consensus standards adopted on May 29, 1971, pursuant to section 6(a) of the Act are from those two sources. However, any organization which deems itself a producer of national consensus standards, within the meaning of section 3(9) of the Act, is invited to submit in writing to the Assistant Secretary of Labor at any time prior to February 1, 1973, all relevant information which may enable the Assistant Secretary to determine whether any of its standards satisfy the requirements of the definition of "national consensus standard" in section 3(9) of the Act.

1910.4 — AMENDMENTS TO THIS PART

(a) The Assistant Secretary of Labor shall have all of the authority of the Secretary of Labor under 3(9) and 6(a) of the Act.

(b) The Assistant Secretary of Labor may at any time before April 28, 1973, on his own motion or upon the written petition of any person, by rule promulgate as a standard any national consensus standard and any established federal standard, pursuant to and in accordance with section 6(a) of the Act, and, in addition, may modify or revoke any standard in this Part 1910. In the event of conflict among any such standards, the Assistant Secre-

YES NO

tary of Labor shall take the action necessary to eliminate the conflict, including the revocation or modification of a standard in this part, so as to assure the greatest protection of the safety or health of the affected employees.

1910.5 — APPLICABILITY OF STANDARDS

(a) Except as provided in paragraph (b) of this section, the standards contained in this part shall apply with respect to employments performed in a workplace in a State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, Guam, Trust Territory of the Pacific Islands, Wake Island, Outer Continental Shelf Lands defined in the Outer Continental Shelf Lands Act, Johnston Island, and the Canal Zone.

(b) None of the standards in this part shall apply to working conditions of employees with respect to which federal agencies other than the Department of Labor, or state agencies acting under section 274 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2021), exercise statutory authority to prescribe or enforce standards or regulations affecting occupational safety or health.

(c)

(1) If a particular standard is specifically applicable to a condition, practice, means, method, operation, or process, it shall prevail over any different general standard which might otherwise be applicable to the same condition, practice, means, method, operation, or process.

(2) On the other hand, any standard shall apply according to its terms to any employment and place of employment in any industry, even though particular standards are also prescribed for the industry, as in Subpart B or Subpart R of this part, to the extent that none of such particular standards applies. To illustrate, the general standard regarding noise exposure in 1910.95 applies to employments and places of employment in pulp, paper, and paperboard mills covered in 1910.261.

(d) In the event a standard protects on its face a class of persons larger than employees, the standard shall be applicable under this part only to employees and their employment and places of employment.

(e) [Reserved]

(f) An employer who is in compliance with any standard in this part shall be deemed to be in compliance with the requirement of section 5(a)(1) of the Act*, but only to the extent of the condition, practice, means, method, operation, or process covered by the standard.

1910.6 — INCORPORATION BY REFERENCE

(a) The standards of agencies of the U.S. Government and organizations which are not agencies of the U.S. Government which are legally incorporated by reference in this part, have the same force and effect as other standards in this part.

(b) Copies of the standards which are incorporated by reference may be examined at the national office of the Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20210, or at any of its regional offices.

Copies of such private standards may be obtained from the issuing organizations.

(c) Any changes in the standards incorporated by reference in this part and an official historic file of such changes are available for inspection at the national office of the Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C. 20210.

1910.7 — DEFINITION AND REQUIREMENTS FOR A NATIONALLY RECOGNIZED TESTING LABORATORY

(a) Application. This section shall apply only when the term "nationally recognized testing laboratory" is used in other sections of this Part.

(b) Laboratory requirements. The term "nationally recognized testing laboratory" (NRTL) means an organization which is recognized by OSHA in accordance with Appendix A of this section and which tests for safety, and lists or labels or accepts, equipment or materials and which meets all of the following criteria:

(1) For each specified item of equipment or material to be listed, labeled or accepted, the NRTL has the capability (including proper testing equipment and facilities, trained staff, written testing procedures, and calibration and quality control programs) to perform:

(i) Testing and examining equipment and materials for workplace safety purposes to determine conformance with appropriate test standards; or

(ii) Experimental testing and examining of equipment and materials for workplace safety purposes to determine conformance with appropriate test standards or performance in a specified manner.

(2) The NRTL shall provide, to the extent needed for the particular equipment or materials listed, labeled, or accepted, the following controls or services:

(i) Implements control procedures for identifying the listed and labeled equipment or materials;

(ii) Inspects the run of production of such items at factories for product evaluation purposes to assure conformance with the test standards; and

(iii) Conducts field inspections to monitor and assure the proper use of its identifying mark or labels on products;

(3) The NRTL is completely independent of employers subject to the tested equipment requirements, and of any manufacturers or vendors of equipment or materials being tested for these purposes; and,

(4) The NRTL maintains effective procedures for:

(i) Producing creditable findings or reports that are objective and without bias; and

(ii) Handling complaints and disputes under a fair and reasonable system.

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*The General Duty Clause

1910.7 – DEFINTION AND REQUIREMENTS FOR A NATIONALLY RECOGNIZED TESTING LABORATORY

YES NO

(c) Test standards. An "appropriate test standard" referred to in § 1910.7(b)(1)(i) and (ii) is a document which specifies the safety requirements for specific equipment or class of equipment and is:

(1) Recognized in the United States as a safety standard providing an adequate level of safety, and

(2) Compatible with and maintained current with periodic revisions of applicable national codes and installation standards, and

(3) Developed by a standards developing organization under a method providing for input and consideration of views of industry groups, experts, users, consumers, governmental authorities, and others having broad experience in the safety field involved, or

1910.7 – DEFINITION AND REQUIREMENTS FOR A NATIONALLY RECOGNIZED TESTING LABORATORY

YES NO

(4) In lieu of paragraphs (c)(1), (2), and (3), the standard is currently designated as an American National Standards Institute (ANSI) safety-designated product standard or an American Society for Testing and Materials (ASTM) test standard used for evaluation of products or materials.

(d) Alternative test standards. If a testing laboratory desires to use a test standard other than one allowed under paragragh (c) of this section, then the Assistant Secretary of Labor shall evaluate the proposed standard to determine that it provides an adequate level of safety before it is used.

(e) Implementation. A testing organization desiring recognition by OSHA as an NRTL shall request that OSHA evaluate its testing and control programs against the requirements in this section for any equipment or material it may specify. The recognition procedure shall be conducted in accordance with Appendix A to this section.

APPENDIX A

1910.7—OSHA RECOGNITION PROCESS FOR NATIONALLY RECOGNIZED TESTING LABORATORIES

Introduction

This Appendix provides requirements and criteria which OSHA will use to evaluate and recognize a Nationally Recognized Testing Laboratory (NRTL). This process will include the evaluation of the product evaluation and control programs being operated by the NRTL, as well as the NRTL's testing facilities being used in its program. In the evaluation of the NRTLs, OSHA will use either consensus-based standards currently in use nationally, or other standards or criteria which may be considered appropriate. This Appendix implements the definition of NRTL in 29 CFR 1910.7 which sets out the criteria that a laboratory must meet to be recognized by OSHA (initially and on a continuing basis). The Appendix is broader in scope, providing procedures for renewal, expansion, and revocation of OSHA recognition. Except as otherwise provided, the burden is on the applicant to establish by a preponderance of the evidence that it is entitled to recognition as an NRTL. If further detailing of these requirements and criteria will assist the NRTLs or OSHA in this activity, the detailing will be done through appropriate OSHA Program Directives.

I. Procedures for Initial OSHA Recognition.

A. Applications.

1. *Eligibility.* a. Any testing agency or organization considering itself to meet the definition of nationally recognized testing laboratory as specified in § 1910.7 may apply for OSHA recognition as an NRTL.

b. However, in determining eligibility for a foreign-based testing agency or organization, OSHA shall take into consideration the policy of the foreign government regarding both the acceptance in that country of testing data, equipment acceptances, and listings, and labeling, which are provided through nationally recognized testing laboratories recognized by the Assistant Secretary, and the accessibility to government recognition or a similar system in that country by U.S.-based safety-related testing agencies, whether recognized by the Assistant Secretary or not, if such recognition or a similar system is required by that country.

2. *Content of application.* a. The applicant shall provide sufficient information and detail demonstrating that it meets the requirements set forth in § 1910.7, in order for an informed decision concerning recognition to be made by the Assistant Secretary.

b. The applicant also shall identify the scope of the NRTL-related activity for which the applicant wishes to be recognized. This will include identifying the testing methods it will use to test or judge the specific equipment and materials for which recognition is being requested, unless such test methods are already in the test standard. If requested to do so by OSHA, the applicant shall provide documentation of the efficacy of these testing methods.

c. The applicant may include whatever enclosures, attachments, or exhibits the applicant deems appropriate. The application need not be submitted on a Federal form.

3. *Filing office location.* The application shall be filed with: NRTL Recognition Program, Occupational Safety and Health Administration, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210.

4. *Amendments and withdrawals.* a. An application may be revised by an applicant at any time prior to the completion of activity under paragraph I.B.4. of this Appendix.

b. An application may be withdrawn by an applicant, without prejudice, at any time prior to the final decision by the Assistant Secretary in paragraph I.B.7.c. of this Appendix.

B. Review and Decision Process; Issuance or Renewal.

1. *Acceptance and on-site review.* a. Applications submitted by eligible testing agencies will be accepted by OSHA, and their receipt acknowledged in writing. After receipt of an application, OSHA may request additional information if it believes information relevant to the requirements for recognition has been omitted.

b. OSHA shall, as necessary, conduct an on-site review of the testing facilities of the applicant, as well as the applicant's administrative and technical practices, and, if necessary, review any additional documentation underlying the application.

c. These on-site reviews will be conducted by qualified individuals technically expert in these matters, including, as appropriate, non-Federal consultants/contractors acceptable to OSHA. The protocol for each review will be based on appropriate national consensus standards or international guides, with such additions, changes, or deletions as may be considered necessary and appropriate in each case by OSHA. A written report shall be made for each on-site review and a copy shall be provided to the applicant.

2. *Positive finding by staff.* If, after review of the application, and additional information, and the on-site review report, the applicant appears to have met the requirements for recognition, a written recommendation shall be submitted by the responsible OSHA personnel to the Assistant Secretary that the application be approved, accompanied by a supporting explanation.

3. *Negative finding by staff.*—a. Notification to applicant. If, after review of the application, any additional information and the on-site review report, the applicant does not appear to have met the requirements for recognition, the responsible OSHA personnel shall notify the applicant in writing, listing the specific requirements of § 1910.7 and this Appendix which the applicant has not met, and allow a reasonable period for response.

b. *Revision of application.* (i) After receipt of a notification of negative finding (i.e., for intended disapproval of the application and within the response period provided, the applicant may:

(a) Submit a revised application for further review, which could result in a positive finding by the responsible OSHA personnel pursuant to subsection I.B.2. of this Appendix; or

(b) Request that the original application be submitted to the Assistant Secretary with an attached statement of reasons, supplied by the applicant of why the application should be approved.

(ii) This procedure for applicant notification and potential revision shall be used only once during each recognition process.

4. *Preliminary finding by Assistant Secretary.*—a. The Assistant Secretary, or a special designee for this purpose, will make a preliminary finding as to whether the applicant has or has not met the requirements for recognition, based on the completed application file, the written staff recommendation, and the statement of reasons supplied by the applicant if there remains a staff recommendation of disapproval.

b. Notification of this preliminary finding will be sent to the applicant and subsequently published in the **Federal Register**.

c. This preliminary finding shall not be considered an official decision by the Assistant Secretary or OSHA, and does not confer any change in status or any interim or temporary recognition for the applicant.

5. *Public review and comment period.*—a. The **Federal Register** notice of preliminary finding will provide a period of not less than 60 calendar days for written comments on the applicant's fulfillment of the requirements for recognition. The application, supporting documents, staff recommendation, statement of applicant's reasons, and any comments received, will be available for public inspection in the OSHA Docket Office.

b. Any member of the public, including the applicant, may supply detailed reasons and evidence supporting or challenging the sufficiency of the applicant's having met the requirements of the definition of 29 CFR § 1910.7 and this Appendix. Submission of pertinent documents and exhibits shall be made in writing by the close of the comment period.

6. *Action after public comment.*—a. Final decision by Assistant Secretary. Where the public review and comment record supports the Assistant Secretary's preliminary finding concerning the application, i.e., absent any serious objections or substantive claims contrary to the preliminary finding having been received in writing from the public during the comment period, the Assistant Secretary will proceed to final written decision on the application. The reasons supporting this decision shall be derived from the evidence available as a result of the full application, the supporting documentation, the staff finding, and the written comments and evidence presented during the public review and comment period.

b. *Public announcement.* A copy of the Assistant Secretary's final decision will be provided to the applicant. Subsequently, a notification of the final decision shall be published in the **Federal Register**. The publication date will be the effective date of the recognition.

c. *Review of final decision.* There will be no further review activity available within the Department of Labor from the final decision of the Assistant Secretary.

7. *Action after public objection*—a. Review of negative information. At the discretion of the Assistant Secretary or his designee, OSHA may authorize Federal or contract personnel to initiate a special review of any information provided in the public comment record which appears to require resolution, before a final decision can be made.

b. *Supplementation of record.* The contents and results of special reviews will be made part of this record by the Assistant Secretary by either:

(i) Reopening the written comment period for public comments on these reviews; or

(ii) Convening an informal hearing to accept public comments on these reviews, conducted under applicable OSHA procedures for similar hearings.

c. *Final decision by the Assistant Secretary.* The Assistant Secretary shall issue a decision as to whether it has been demonstrated, based on a preponderance of the evidence, that the applicant meets the requirements for recognition. The reasons supporting this decision shall be derived from the evidence available as a result of the full application, the supporting documentation, the staff finding, the comments and evidence presented during the public review and comment period, and written to transcribed evidence received during any subsequent reopening of the written comment period or informal public hearing held.

d. *Public announcement.* A copy of the Assistant Secretary's final decision will be provided to the applicant, and a notification will be published in the **Federal Register** subsequently announcing the decision.

e. *Review of final decision.* There will be no further review activity available within the Department of Labor from the final decision of the Assistant Secretary.

c. *Terms and conditions of recognition.* The following terms and conditions shall be part of every recognition:

1. Letter of recognition. The recognition by OSHA of any NRTL will be evidenced by a letter of recognition from OSHA. The letter will provide the specific details of the scope of the OSHA recognition, including the specific equipment or materials for which OSHA recognition has been granted, as well as any specific conditions imposed by OSHA.

2. *Period of recognition.* The recognition by OSHA of each NRTL will be valid for five years, unless terminated before the expiration of the period. The dates of the period of recognition will be stated in the recognition letter.

3. *Constancy in operations.* The recognized NRTL shall continue to satisfy all the requirements or limitations in the letter of recognition during the period of recognition.

4. Accurate publicity. The OSHA-recognized NRTL shall not engage in or permit others to engage in misrepresentation of the scope or conditions of its recognition.

5. *Temporary Recognition of Certain NRTLs.*—a. Notwithstanding all other requirements and provisions of §1910.7 and this Appendix, the following two organizations are recognized temporarily as nationally recognized testing laboratories by the Assistant Secretary for a period of five years beginning June 13, 1988 and ending on July 13, 1993:

(i) Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, Illinois 60062.

(ii) Factory Mutual Research Corporation, 1151 Boston-Providence Turnpike, Norwood, Massachusetts 02062.

b. At the end of the five-year period, the two temporarily recognized laboratories shall apply for renewal of OSHA recognition utilizing the following procedures established for renewal of OSHA recognition.

II. *Supplementary Procedures*

A. Test standard changes.

A recognized NRTL may change a testing standard or elements incorporated in the standard such as testing methods or pass-fail criteria by notifying the Assistant Secretary of the change, certifying that the revised standard will be at least as effective as the prior standard, and providing the supporting data upon which its conclusions are based. The NRTL need not inform the Assistant Secretary of minor deviations from a test standard such as the use of new instrumentation that is more accurate or sensitive than originally called for in the standard. The NRTL also need not inform the Assistant Secretary of its adoption of revisions to third-party testing standards meeting the requirements of §1910.7(c)(4), if such revisions have been developed by the standards developing organization, or of its adoption of revisions to other third-party test standards which the developing organization has submitted to OSHA. If, upon review, the Assistant Secretary or his designee determines that the proposed revised standard is not ''substantially equivalent'' to the previous version with regard to the level of safety obtained, OSHA will not accept the proposed testing standard by the recognized NRTL, and will initiate discontinuance of that aspect of OSHA-recognized NRTL activity by the NRTL by modification of the official letter of recognition. OSHA will publicly announce this action and the NRTL will be required to communicate this OSHA decision directly to affected manufacturers.

B. *Expansion of current recognition*

1. *Eligibility.* A recognized NRTL may apply to OSHA for an expansion of its current recognition to cover other categories of NRTL testing in addition to those included in the current recognition.

2. *Procedure.* a. The application for expansion will be acted upon and processed by OSHA in accordance with subsection I.B. of this Appendix.

b. In that process, OSHA may decide not to conduct an on-site review, where the substantive scope of the request to expand recognition is closely related to the current area of recognition.

c. The expiration for each expansion of recognition shall coincide with the expiration date of the current basic recognition period.

C. *Renewal of OSHA recognition*

1. *Eligibility.* A recognized NRTL may renew its recognition by filing a renewal request at the address in paragraph I.A.3, of this Appendix not less than nine months, nor more than one year, before the expiration date of its current recognition.

2. *Procedure.*—a. The renewal request will be processed in accordance with subsection I.B. of this Appendix.

b. In that process, OSHA may determine not to conduct the on-site reviews in I.B.1a. where appropriate.

c. When a recognized NRTL has filed a timely and sufficient renewal request, its current recognition will not expire until a final decision has been made by OSHA on the request.

d. After the first renewal has been granted to the NRTL, the NRTL shall apply for a continuation of its recognition status every five years by submitting a renewal request. In lieu of submitting a renewal request after the initial renewal, the NRTL may certify its continuing compliance with the terms of its letter of recognition and 29 CFR 1910.7.

3. *Alternative procedure.* After the initial recognition and before the expiration thereof, OSHA may (for good cause) determine that there is a sufficient basis to dispense with the renewal requirement for a given laboratory and will so notify the laboratory of such a determination in writing. In lieu of submitting a renewal request, any laboratory so notified shall certify its continuing compliance with the terms of its letter of recognition and 29 CFR 1910.7.

D. *Voluntary termination of recognition.*

At any time, a recognized NRTL may voluntarily terminate its recognition, either in its entirety or with respect to any area covered in its recognition, by giving written notice to OSHA. The written notice shall state the date as of which the termination is to take effect. The Assistant Secretary shall inform the public of any voluntary termination by **Federal Register** notice.

E. *Revocation of recognition by OSHA.*

1. *Potential causes.* If an NRTL either has failed to continue to substantially satisfy the requirements of §1910.7 or this Appendix, or has not been reasonably performing the NRTL testing requirements encompassed within its letter of recognition, or has materially misrepresented itself in its applications or misrepresented the scope or conditions of its recognition, the Assistant Secretary may revoke the recognition of a recognized NRTL, in whole or in part. OSHA may initiate revocation procedures on the basis of information provided by any interested person.

2. *Procedure.*—a. Before proposing to revoke recognition, the Agency will notify the recognized NRTL in writing, giving it the opportunity to rebut or correct the alleged deficiencies which would form the basis of the proposed revocation, within a reasonable period.

b. If the alleged deficiencies are not corrected or reconciled within a reasonable period, OSHA will propose, in writing to the recognized NRTL, to revoke recognition. If deemed appropriate, no other announcement need be made by OSHA.

c. The revocation shall be effective in 60 days unless within that period the recognized NRTL corrects the deficiencies or requests a hearing in writing.

d. If a hearing is requested, it shall be held before an adminstrative law judge of the Department of Labor pursuant to the rules specified in 29 CFR Part 1905, Subpart C.

e. The parties shall be OSHA and the recognized NRTL. The Assistant Secretary may allow other interested persons to participate in these hearings if such participation would contribute to the resolution of issues germane to the proceeding and not cause undue delay.

f. The burden of proof shall be on OSHA to demonstrate by a preponderance of the evidence that the recognition should be revoked because the NRTL is not meeting the requirements for recognition, has not been reasonably performing the product testing functions as required by §1910.7, this Appendix A, or the letter of recognition, or has materially misrepresented itself in its applications or publicity.

3. *Final decision.* a. After the hearing, the Administrative Law Judge shall issue a decision stating the reasons based on the record as to whether it has been demonstrated, based on a preponderance of evidence, that the applicant does not continue to meet the requirements for its current recognition.

b. Upon issuance of the decision, any party to the hearing may file exceptions within 20 days pursuant to 29 CFR 1905.28. If no exceptions are filed, this decision is the final decision of the Assistant Secretary. If objections are filed, the Administrative Law Judge shall forward the decision, exceptions, and record to the Assistant Secretary for the final decision on the proposed revocation.

c. The Assistant Secretary will review the record, the decision by the Administrative Law Judge, and the exceptions filed. Based on this, the Assistant Secretary shall issue the final decision as to whether it has been demonstrated, by a preponderance of evidence, that the recognized NRTL has not continued to meet the requirements for OSHA recognition. If the Assistant Secretary finds that the NRTL does not meet the NRTL recognition requirements, the recognition will be revoked.

4. *Public announcement.* A copy of the Assistant Secretary's final decision will be provided to the applicant, and a notification will be published in the **Federal Register** announcing the decision, and the availability of the complete record of this proceeding at OSHA. The effective date of any revocation will be the date the final decision copy is sent to the NRTL.

5. *Review of final decision.* There will be no further review activity available within the Department of Labor from the final decision of the Assistant Secretary.

(Approved by the Office of Management and Budget under Control Number 1218-0147)

OVERVIEW: SUBPART B

ADOPTION AND EXTENSION OF FEDERAL STANDARDS

Standards in this subpart spell out the application of the OSH Act's standards to specific industries, occupational activities, operations, and conditions. In effect, the standards apply to every employer, employee, and employment condition. Subpart B extends the standards contained in the 1910 series to specific industries, including:

- construction work
- ship repairing
- shipbuilding
- shipbreaking
- longshoring and marine terminals
- related activities

SUBPART B — ADOPTION AND EXTENSION OF ESTABLISHED FEDERAL STANDARDS

YES NO

Subpart B material includes federal OSHA provisions which adopt and extend the applicability of the safety and health standards of Part 1910 to specific places of employment, employers, and types of work condition and activities.

1910.11 — PURPOSE AND SCOPE

(a) The provisions of this Subpart B adopt and extend the applicability of established federal standards in effect on April 28, 1971, with respect to every employer, employee, and employment covered by the Act.

(b) It bears emphasis that only standards (i.e., substantive rules) relating to safety or health are adopted by any incorporations by reference of standards prescribed elsewhere in this chapter or this title.

1910.12 — CONSTRUCTION WORK

(a) Standards.

The standards prescribed in Part 1926 of this chapter are adopted as occupational safety and health standards under section 6 of the Act and shall apply, according to the provisions thereof, to every employment and place of employment of every employee engaged in construction. Each employer shall protect the employment and places of employment of each of his employees engaged in construction work by complying with the appropriate standards prescribed in this paragraph.

(b) Definition.

For purposes of this section, "construction work" means work for construction, alteration, and/or repair, including painting and decorating.

(c) Construction Safety Act distinguished.

This section adopts as occupational safety and health standards under section 6 of the Act the standards which are prescribed in Part 1926 of this chapter.

(d) For the purposes of this part, to the extent that it may not already be included in paragraph (b) of this section, "construction work" includes the erection of new electric transmission and distribution lines and equipment, and the alteration, conversion, and improvement of the existing transmission and distribution lines and equipment.

1910.13 — SHIP REPAIRING

(a) Adoption and extension of established safety and health standards for ship repairing.

(b) Definitions.

For purposes of this section:

(1) "Ship repair" means any repair of a vessel, including, but not restricted to, alterations, conversions, installations, cleaning, painting, and maintenance work,

YES NO

1910.13 — SHIP REPAIRING

(2) "Related employment" means any employment performed as an incident to, or in conjunction with, ship repair work, including, but not restricted to, inspection, testing, and employment as a watchman; and

(3) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water, including special purpose floating structures not primarily designed for, or used a means of, transportation on water.

1910.14 — SHIPBUILDING

(a) Adoption and extension of established safety and health standards for shipbuilding.

(b) Definitions.

For purposes of this section:

(1) "Shipbuilding" means the construction of a vessel, including the installation of machinery and equipment;

(2) "Related employment" means any employment performed as an incident to, or in conjunction with, shipbuilding work, including, but not restricted to, inspection, testing trials, and employment as a watchman; and

(3) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water, including special purpose floating structures not primarily designed for, or used as a means of, transportation on water.

1910.15 — SHIPBREAKING

(a) Adoption and extension of established safety and health standards for shipbreaking.

(b) Definitions.

For purposes of this section:

(1) "Shipbreaking" means any breaking down of a vessel's structure for the purpose of scrapping the vessel, including the removal of gear, equipment, or any component part of a vessel;

(2) "Related employment" means any employment performed as an incident to, or in conjunction with, shipbreaking work, including, but not restricted to, inspection, survey, and employment as a watchman; and

(3) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water, including special purpose floating structures not primarily designed for, or used as a means of, transportation on water.

1910.16 — LONGSHORING AND MARINE TERMINALS

YES NO

(a) Adoption and extension of established safety and health standards for longshoring.

(b) Safety and health standards for marine terminals. [Added 1983, except where noted]

Part 1917 of this title shall apply exclusively, according to the provisions thereof, to employment within a marine terminal, except as follows:

(1) The provisions of Part 1917 do not apply to the following:
  (i) Facilities used solely for the bulk storage, handling and transfer of flammable and combustible liquids and gases.
  (ii) Facilities subject to the regulations of the Office of Pipeline Safety Regulation of the Materials Transportation Bureau, Department of Transportation, to the extent such regulations apply to specific working conditions.
  (iii) Fully automated bulk coal handling facilities continguous to electrical power generating plants.

(2) Part 1910 does not apply to marine terminals except for the following:
  (i) **Electrical.** Subpart S;
  (ii) **Toxic and hazardous substances.** Subpart Z applies where specifically referenced in Part 1917 except that the requirements of Subpart Z do not apply when a substance or cargo is contained within a sealed, intact means of packaging or containment complying with Department of Transportation or International Maritime Organization requirements;
  (iii) **Noise.** Subpart G, section 1910.95;
  (iv) **Commercial diving operations.** Subpart T;
  (v) **Safety requirements for scaffolding.** Subpart D, section 1910.28;
  (vi) **Abrasive blasting.** Subpart G, section 1910.94 (a);
  (vii) **Access to employee exposure and medical records.** Subpart C, section 1910.20;
  (viii) **Respiratory protection.** Subpart I, section 1910.134;
  (ix) **Servicing multi-piece and single piece rim wheels.** Subpart N, section 1910.177. **[Added 1987]**

(c) Definitions.

For purposes of this section:

(1) "Longshoring operation" means the loading, unloading, moving, or handling of, cargo, ship's stores, gear, etc., into, in, on, or out of any vessel;

(2) "Related employment" means any employment performed as an incident to or in conjunction with, longshoring operations including, but not restricted to, securing cargo, rigging, and employment as a porter, checker, or watchman; and

(3) "Vessel" includes every description of watercraft or other artificial contrivance used, or capable of being used, as a means of transportation on water, including special purpose floating structures not primarily designed for, or used as a means of, transportation on water.

(4) "Marine Terminal" means wharves, bulkheads, quays, piers, docks and other berthing locations and adjacent storage or contiguous areas and structures associated with the primary movements of cargo or materials from vessel to shore or shore to vessel, including structures which are devoted to receiving, handling, holding, consolidation and loading or delivery of waterborne shipments and pasengers, including areas devoted to the maintenacne of the terminal or equipment. The term does not include production or manufacturing areas having their own docking facilities and located at a marine terminal, nor does the term include storage facilities directly associated with those production or manufacturing areas. **[Added 1983]**

1910.17 — EFFECTIVE DATES

(a) The standards prescribed in this Subpart B became effective for general industry on August 27, 1971.

(1) To the extent that standards prescribed in 1910.12 apply to light residential construction or to other construction work which is not subject to the construction safety standards in Part 1926, their application became effective September 27, 1971.

(2) For the purpose of subparagraph (1), "light residential construction" is limited to construction of homes and apartments which do not exceed three stories in height, and which have no elevator.

1910.18 — CHANGES IN ESTABLISHED FEDERAL STANDARDS

Whenever an occupational safety and health standard adopted and incorporated by reference in this Subpart B is changed pursuant to section 6(b) of the Act and the statute under which the standard was originally promulgated, and in accordance with Part 1911 of this chapter, the standard shall be deemed changed for purposes of that statute and this Subpart B, and shall apply under this Subpart B.

For the purposes of this section, a change in a standard includes any amendment, addition, or repeal, in whole or in part, of any standard.

1910.19 — SPECIAL PROVISIONS FOR AIR CONTAMINANTS

YES NO

(a) Asbestos, tremolite, anthophyllite, and actinolite dust. Section 1910.1001 shall apply to the exposure of every employee to asbestos, tremolite, anthophyllite, and actinolite dust in every employment and place of employment covered by Sections 1910.12, 1910.13, 1910.14, 1910.15, or 1910.16, in lieu of any different standard on exposure to asbestos, tremolite, anthophyllite, and actinolite dust which would otherwise be applicable by virtue of any of those sections. **[Revised 1986]**

(b) Vinyl Chloride. Section 1019.1017 shall apply to the exposure of every employee to vinyl chloride in every employment and place of employment covered by Sections 1910.12, 1910.13, 1910.14, 1910.15, or 1910.16, in lieu of any different standard on exposure to vinyl chloride which would otherwise be applicable by virtue of any of those sections.

(c) Acrylonitrile. Section 1910.1045 shall apply to the exposure of every employee to acrylonitrile in every employment and place of employment covered by Sections 1910.12, 1910.13, 1910.14, 1910.15, or 1910.16, in lieu of any different standard on exposure to acrylonitrile which would otherwise by applicable by virtue of any of those sections.

(d) [Removed 1981]

(e) Inorganic Arsenic. Section 1910.18 shall apply to the exposure of every employee to inorganic arsenic in every employment covered by Sections 1910.12, 1910.13, 1910.14, 1910,15, or 1910.16, in lieu of any different standard on exposure to inorganic arsenic which would otherwise be applicable by virtue of any of those sections.

1910.19 — SPECIAL PROVISIONS FOR AIR CONTAMINANTS

YES NO

(f) [Removed 1985]

(g) Lead. Section 1910.1025 shall apply to the exposure of every employee to lead in every employment and place of employment covered by Sections 1910.13, 1910.14, 1910.15, or 1910.16, in lieu of any different standard on exposure to lead which would otherwise be applicable by virtue of those sections.

(h) Ethylene Oxide. Section 1910.1047 shall apply to the exposure of every employee to ethylene oxide in every employment and place of employment covered by section 1910.12, 1910.13, 1910.14, 1910.15, or 1910.16, in lieu of any different standard on exposure to ethylene oxide which would otherwise be applicable.

(i) Benzene. Section 1910.1028 shall apply to the exposure of every employee to benzene in every employment and place of employment covered by Sections 1910.12, 1910.13, 1910.14, 1910.15, or 1910.16 in lieu of any different standard on exposures to benzene which would otherwise be applicable by virtue of those sections.

(j) Formaldehyde. Section 1910.1048 shall apply to the exposure of every employee to formaldehyde in every employment and and place of employment covered by Sections 1910.12, 1910.13, 1910.14, 1910.15, or 1910.16 in lieu of any different standard on exposure to formaldehyde which would otherwise be applicable by virtue of those sections. **[Added 1987]**

OVERVIEW: SUBPART C

ACCESS TO EMPLOYEE MEDICAL AND EXPOSURE RECORDS

This standard spells out the responsibilities of employers in providing employees, or authorized employee representatives, access to medical records and records of exposure to toxic substances, contaminants, or other conditions which can have an adverse effect on an employee's health. The standard is specific in its language not to interfere with legal or ethical obligations to maintain the confidentiality of personal medical history and information.

Access is defined in the standard to mean the right to examine and also to make a copy or copies of the record.

Medical and exposure records to which access is to be permitted include any of the following kinds of information:

- Environmental monitoring or measuring
- Personal or other forms of sampling
- Biological monitoring results
- Material safety data sheets, or identity of toxic substance or harmful agent
- Medical and employment questionnaire or histories (including job description/occupational exposures)
- Medical examination results (including x-rays)
- Medical opinions and recommendations
- Employee medical complaints

Records concerning health insurance claims that are maintained separately from the employer's medical program, and which are not accessible to the employer by employee name or identification are not subject to the accessibility rule. Likewise, records related to voluntary employee assistance (alcohol, drug abuse, personal counseling) need not be provided, if such records are maintained separately from the medical program records.

Included with the checklist for this standard is a recommended form for authorization for release of medical record information on page C—App—1, identified as Appendix A to this standard. On page C—App—2 there is an Appendix B which provides references to sources of information on toxic effects of chemical substances.

1910.20 — ACCESS TO EMPLOYEE EXPOSURE AND MEDICAL RECORDS

(a) Purpose. The purpose of this section is to provide employees and their designated representatives a right of access to relevant exposure and medical records, and to provide representatives of the Assistant Secretary a right of access to these records. Access by employees, their representatives, and the Assistant Secretary is necessary to yield both direct and indirect improvements in the detection, treatment and prevention of occupational disease.

Each employer is responsible for assuring compliance with this section, but the activities involved in complying with the access to medical records provisions can be carried out, on behalf of the employer, by the physician or other health care personnel in charge of employee medical records.

Except as expressly provided, nothing in this section is intended to affect existing legal and ethical obligations concerning the maintenance and confidentiality of employee medical information, the duty to disclose information to a patient employee or any other aspect of the medical-care relationship, or affect existing legal obligations concerning the protection of trade secret information.

(b) Scope and Application.

(1) This section applies to each general industry, maritime, and construction employer who makes, maintains, contracts for, or has access to employee exposure or medical records, or analyses thereof, pertaining to employees exposed to toxic substances or harmful physical agents.

(2) This section applies to all employee exposure and medical records, and analyses thereof, of employees exposed to toxic substances or harmful physical agents, whether or not the records are related to specific occupational safety and health standards.

(3) This section applies to all employee exposure and medical records, and analyses thereof, made or maintained in any manner, including on an in-house or contractual (e.g., fee-for-service) basis.

Each employer shall assure that the preservation and access requirements of this section are complied with regardless of the manner in which records are made or maintained.

(c) Definitions.

(1) "Access" means the right and opportunity to examine and copy.

(2) "Analysis using exposure or medical records" means any compilation of data, or any research, statistical or other study based at least in part on information collected from individual employee exposure or medical records or information collected from health insurance claims records, provided that either the analysis has been reported to the employer or no further work is currently being done by the person responsible for preparing the analysis.

(3) "Designated representative" means any individual or organization to whom an employee gives written authorization to exercise a right of access.

For the purposes of access to employee exposure records and analyses using exposure or medical records, a recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

(4) "Employee" means a current employee, a former employee, or an employee being assigned or transferred to work where there will be exposure to toxic substances or harmful physical agents.

In the case of a deceased or legally incapacitated employee, the employee's legal representative may directly exercise all the employee's rights under this section.

(5) "Employee exposure record" means a record containing any of the following kinds of information concerning employee exposure to toxic substances or harmful physical agents:

(i) environmental (workplace) monitoring or measuring, including personal, area, grab, wipe, or other form of sampling, as well as related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained;

(ii) biological monitoring results which directly assess the absorption of a substance or agent by body systems (e.g., the level of a chemical in the blood, urine, breath, hair, fingernails, etc.) but not including results which assess the biological effect of a substance or agent;

(iii) material safety data sheets; or

(iv) in the absence of the above, any other record which reveals the identity (e.g., chemical, common, or trade name) of a toxic substance or harmful physical agent.

(6)

(i) "Employee medical record" means a record concerning the health status of an employee which is made or maintained by a physician, nurse, or other health care personnel, or technician, including:

(a) medical and employment questionnaires or histories (including job description and occupational exposures),

(b) the results of medical examinations (pre-employment, pre-assignment, periodic, or episodic) and laboratory tests (including X-ray examinations and all biological monitoring),

(c) medical opinions, diagnoses, progress notes, and recommendations,

(d) descriptions of treatments and prescriptions, and

(e) employee medical complaints.

(ii) "Employee medical record" does not include the following:

(a) physical specimens (e.g., blood or urine samples) which are routinely discarded as a part of normal medical practice, and are not required to be maintained by other legal requirements.

(b) records concerning health insurance claims if maintained separately from the employer's medical program and its records, and not accessible to the employer by employee name or other direct personal identifier (e.g., social security number, payroll number, etc.), or (**c**) records concerning voluntary employee assistance programs (alcohol, drug abuse, or personal counseling programs) if maintained separately from the employer's medical program and its records.

(**7**) "Employer" means a current employer, a former employer, or a successor employer.

(**8**) "Exposure" or "exposed" means that an employee is subjected to a toxic substance or harmful physical agent in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes past exposure and potential (e.g., accidental or possible) exposure, but does not include situations where the employer can demonstrate that the toxic substance or harmful physical agent is not used, handled, stored, generated, or present in the workplace in any manner different from typical non-occupational situations.

(**9**) "Record" means any item, collection, or grouping of information regardless of the form or process by which it is maintained (e.g., paper document, microfiche, microfilm, X-ray film, or automated data processing).

(**10**) "Specific written consent"

(**i**) means a written authorization containing the following:

(**a**) the name and signature of the employee authorizing the release of medical information,

(**b**) the date of the written authorization,

(**c**) the name of the individual or organization that is authorized to release the medical information,

(**d**) the name of the designated representative (individual or organization) that is authorized to receive the released information,

(**e**) a general description of the medical information that is authorized to be released,

(**f**) a general description of the purpose for the release of the medical information,

(**g**) a date or condition upon which the written authorization will expire (if less than one year).

(**ii**) A written authorization does not operate to authorize the release of medical information not in existence on the date of written authorization, unless this is expressly authorized, and does not operate for more than one year from the date of written authorization.

(**iii**) A written authorization may be revoked in writing prospectively at any time.

(**11**) "Toxic substance or harmful physical agent" means any chemical substance, biological agent (bacteria, virus fungus, etc.), or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing and non-ionizing radiation, hypo- or hyperbaric pressure, etc.) which:

(**i**) is regulated by any federal law or rule due to a hazard to health,

(**ii**) is listed in the latest printed edition of the National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS) (See Appendix B),

(**iii**) has yielded positive evidence of an acute or chronic health hazard in human, animal, or other biological testing conducted by, or known, to the employer, or

(**iv**) has a material safety data sheet available to the employer indicating that the material may pose a hazard to human health.

(d) Preservation of records.

(**1**) Unless a specific occupational safety and health standard provides a different period of time, each employer shall assure the preservation and retention of records as follows:

(**i**) **Employee medical records.** Each employee medical record shall be preserved and maintained for at least the duration of employment plus thirty (30) years.

Health insurance claims records maintained separately from the employer's medical program and its records need not be retained for any specified period;

(**ii**) **Employee exposure records.** Each employee exposure record shall be preserved and maintained for at least thirty (30) years, except that:

(**a**) Background data to environmental (workplace) monitoring or measuring, such as laboratory reports and worksheets, need only be retained for one (1) year so long as the sampling results, the collection methodology (sampling plan), a description of the analytical and mathematical methods used, and a summary of other background data relevant to interpretation of the results obtained, are retained for at leasty thirty (30) years; and

(**b**) Material safety data sheets and paragraph (c)(5)(iv) records concerning the identity of a substance or agent need not be retained for any specified period as long as some record of the identity (chemical name if known) of the substance or agent, where it was used, and when it was used is retained for at least thirty (30) years; and

(**c**) First aid records and experimental toxicological research records are exempt from the 30-year retention requirement; and

(**d**) Personal medical records for short-term employees (less than one year) do not have to be retained if they are provided to the employee on termination.

(**iii**) **Analyses using exposure of medical records.** Each analysis using exposure of medical records shall be preserved and maintained for at least thirty (30) years.

(**2**) Nothing in this section is intended to mandate the form, manner, or process by which an employer preserves a record so long as the information contained in the record is preserved and retrievable. Employers may use microfilm to store all x-rays, except chest x-rays.

(e) Access to records.

(1) General.

(**i**) Whenever an employee or designated representative requests access to a record, the employer shall assure that access is provided in a reasonable time, place, and manner, but in no event later than fifteen (15) days after the request for access is made.

(ii) Whenever an employee or designated representative requests a copy of a record, the employer shall, within the period of time previously specified, assure that either:

(a) a copy of the record is provided without cost to the employee or representative,

(b) the necessary mechanical copying facilities (e.g., photocopying) are made available without cost to the employee or representative for copying the record, or

(c) the record is loaned to the employee or representative for a reasonable time to enable a copy to be made.

(iii) Whenever a record has been previously provided without cost to an employee or designated representative, the employer may charge reasonable, nondiscriminatory administrative costs (i.e., search and copying expenses but not including overhead expenses) for a request by the employee or designated representative for additional copies of the record, except that:

(a) an employer shall not charge for an initial request for a copy of new information that has been added to a record which was previously provided; and

(b) an employer shall not charge for an initial request by a recognized or certified collective bargaining agent for a copy of an employee exposure record or an analysis using exposure or medical records.

(iv) Nothing in this section is intended to preclude employees and collective bargaining agents from collective bargaining to obtain access to information in addition to that available under this section.

(2) Employee and designated representative access.

(i) Employee exposure records. Each employer shall, upon request, assure the access of each employee and designated representative to employee exposure records relevant to the employee. Union representatives are required to show an occupational health need when seeking access to employee exposure records for which employee consent has not been given. For the purpose of this section, exposure records relevant to the employee consist of:

(a) records of the employee's past or present exposure to toxic substances or harmful physical agents,

(b) exposure records of other employees with past or present job duties or working conditions related to or similar to those of the employee,

(c) records containing exposure information concerning the employee's workplace or working conditions,

(d) exposure records pertaining to workplaces or working conditions to which the employee is being assigned or transferred.

(ii) Employee medical records.

(a) Each employer shall, upon request, assure the access of each employee to employee medical records of which the employee is the subject, except as provided in paragraph (e)(2)(ii)(d) below.

(b) Each employer shall, upon request, assure the access of each designated representative to the employee medical records of any employee who has given the designated representative specific written consent.

Appendix A to this section contains a sample form which may be used to establish specific written consent for access to employee medical records.

(c) Whenever access to employee medical records is requested, a physician representing the employer may recommend that the employee or designated representative:

(1) consult with the physician for the purposes of reviewing and discussing the records requested,

(2) accept a summary of material facts and opinions in lieu of the records requested, or

(3) accept release of the requested records only to a physician or other desiganted representative.

(d) Whenever an employee requests access to his or her employee medical records, and a physician representing the employer believes that direct employee access to information contained in the records regarding a specific diagnosis of a terminal illness or a psychiatric condition could be detrimental to the employee's health, the employer may inform the employee that access will only be provided to a designated representative of the employee having specific written consent, and deny the employee's request for direct access to this information.

Where a designated representative with specific written consent requests access to information so withheld, the employer shall assure the access of the designated representative to this information, even when it is known that the designated representative will give the information to the employee.

(e) Nothing in this section precludes a physician, nurse, or other responsible health care personnel maintaining employee medical records from deleting from requested medical records the identity of a family member, personal friend, or fellow employee who has provided confidential information concerning an employee's health status.

(iii) Analyses using exposure or medical records.

(a) Each employer shall, upon request, assure the access of each employee and designated representative to each analysis using exposure or medical records concerning the employee's working conditions or workplace.

(b) Whenever access is requested to an analysis which reports the contents of employee medical records by either direct identifier (name, address, social security number, payroll number, etc.) or by information which could reasonably be used under the circumstances indirectly to identify specific employees (exact age, height, weight, race, sex, date of initial employment, job title, etc.), the employer shall assure that personal identifiers are removed before access is provided.

If the employer can demonstrate that removal of personal identifiers from an analysis is not feasible, access to the personally identifiable portions of the analysis need not be provided.

(3) OSHA Access.

(i) Each employer shall, upon request, assure the immediate access of representatives of the Assistant Secretary of Labor for Occupational Safety and Health to employee exposures and medical records and to analyses using exposure or medical records.

Rules of agency practice and procedure governing OSHA access to employee medical records are contained in 29 CFR 1913.10.

(ii) Whenever OSHA seeks access to personally identifiable employee medical information by presenting to the employer a written access order pursuant to 29 CFR 1913.10(d), the employer shall prominently post a copy of the written access order and its accompanying cover letter for at least fifteen (15) working days.

(f) Trade secrets.

(1) Except as provided in paragraph (f)(2) of this section, nothing in this section precludes an employer from deleting from records requested by an employee or designated representative any trade secret data which discloses manufacturing processes, or discloses the percentage of a chemical substance in a mixture, as long as the employer or designated representative is notified that information has been deleted.

Whenever deletion of trade secret information substantially impairs evaluation of the place where or the time when exposure to a toxic substance or harmful physical agent occurred, the employer shall provide alternative information which is sufficient to permit the employee to identify where and when exposure occurred.

(2) Notwithstanding any trade secret claims, whenever access to records is requested, the employer shall provide access to chemical or physical agent identities including chemical names, levels of exposure, and employee health status data contained in the requested records.

(3) Whenever trade secret information is provided to an employee or designated representative, the employer may require, as a condition of access, that the employee or designated representative agree in writing not to use the trade secret information for the purpose of commercial gain and not to permit misuse of the trade secret information by a competitor or potential competitor of the employer.

(g) Employee Information.

(1) Upon an employee's first entering into employment, and at least annually thereafter, each employer shall inform employees exposed to toxic substances or harmful physical agents of the following:

(i) the existence, location, and availability of any records covered by this section;

(ii) the person responsible for maintaining and providing access to records; and

(iii) each employee's rights of access to these records.

(2) Each employer shall make readily available to employees a copy of this standard and its appendices, and shall distribute to employees any informational materials concerning this standard which are made available to the employer by the Assistant Secretary of Labor for Occupational Safety and Health.

(h) Transfer of records.

(1) Whenever an employer is ceasing to do business, the employer shall transfer all records subject to this section to the successor employer. The successor employer shall receive and maintain these records.

(2) Whenever an employee is ceasing to do business and there is no successor employer to receive and maintain the records subject to this standard, the employer shall notify affected employees of their rights of access to records at least three (3) months prior to the cessation of the employer's business.

(3) Whenever an employer either is ceasing to do business and there is no successor employer to receive and maintain the records, or intends to dispose of any records required to be preserved for at least thirty (30) years, the employer shall:

(i) transfer the records to the director of the National Institute for Occupational Safety and Health (NIOSH) if so required by a specific occupational safety and health standard: or

(ii) notify the Director of NIOSH in writing of the impending disposal of records at least three (3) months prior to the disposal of the records.

(4) Where an employer regularly disposes of records required to be preserved for at least thirty (30) years, the employer may, with at least (3) months notice, notify the Director of NIOSH on an annual basis of the records intended to be disposed of in the coming year.

(i) Appendices. The information contained in the appendices to this section is not intended, by itself, to create any additional obligations not otherwise imposed by this section nor detract from any existing obligation.

(j) Effective date. This section became effective August 21, 1980.

Appendix A to § 1910.20—Sample Authorization Letter for the Release of Employee Medical Record Information to a Designated Representative

I, ______________________________, (full name of worker/patient) hereby authorize ______________________ (individual or organization holding the medical records) to release to ______________________ (individual or organization authorized to receive the medical information), the following medical information from my personal medical records:

____

____

____

____

(Describe generally the information desired to be released).

I give my permission for this medical information to be used for the following purpose: ________________________________, but I do not give permission for any other use or re-disclosure of this information.

(**Note.**—Several extra lines are provided below so that you can place additional restrictions on this authorization letter if you want to. You may, however, leave these lines blank. On the other hand, you may want to (1) specify a particular expiration date for this letter (if less than one year); (2) describe medical information to be created in the future that you intend to be covered by this authorization letter; or (3) describe portions of the medical information in your records which you do not intend to be released as a result of this letter.)

____

____

____

____

____

____

Full name of Employee or Legal
Representative

____

Signature of Employee or Legal
Representative

____

Date of Signature

____

Appendix B to § 1910.20—Availability of NIOSH Registry of Toxic Effects of Chemical Substances (RTECS)[1]

The final standard, 29 CFR 1910.20, applies to all employee exposure and medical records, and analyses thereof, of employees exposed to toxic substances or harmful physical agents (paragraph (b)(2)). The term ''toxic substance or harmful physical agent'' is defined by paragraph (c)(11) to encompass chemical substances, biological agents, and physical stresses for which there is evidence of harmful health effects. The standard uses the lastest printed edition of the National Institute for Occupational Safety and Health (NIOSH) registry of Toxic Effects of Chemical Substances (RTECS) as one of the chief sources of information as to whether evidence of harmful health effects exists. If a substance is listed in the latest printed RTECS, the standard applies to exposure and medical records (and analyses of these records) relevant to employees exposed to the substance.

It is appropriate to note that the final standard does not require that employers purchase a copy of RTECS; and many employers need to consult RTECS to ascertain whether their employee exposure or medical records are subject to the standard. Employers who do not currently have the latest printed edition of the NIOSH RTECS, however, may desire to obtain a copy. The RTECS is issued in an annual printed edition as mandated by section 20(a)(6) of the Occupational Safety and Health Act (29 U.S.C. 669(a)(6)).The 1978 edition is the most recent printed edition as of May 1, 1980. Its Foreward and Introduction describe the RTECS as follows:

''The annual publication of a list of known toxic substances is a NIOSH mandate under the Occupational Safety and Health Act of 1970. It is intended to provide basic information on the known toxic and biological effects of chemical substances for the use of employers, employees, physicians, industrial hygienists, toxicologists, researchers, and, in general, anyone concerned with the proper and safe handling of chemicals. In turn, this information may contribute to a better understanding of potential occupational hazards by everyone involved and ultimately may help to bring about a more healthful workplace environment. (p. iii)

''This Registry contains 124,247 listings of chemical substances: 33,929 are names of different chemicals with their associated toxicity data and 90,318 are synonyms. This edition includes approximately 7,500 new chemical compounds that did not appear in the 1977 Registry. (p. xiii)

''The Registry's purposes are many, and it serves a variety of users. It is a single source document for basic toxicity information and for other data, such as chemical identifiers and information necessary for the preparation of safety directives and hazard evaluations for chemical substances. The various types of toxic effects linked to literature citations provide researchers and occupational health scientists with an introduction to the toxicological literature, making their own review of the toxic hazards of a given substance easier. By presenting data on the lowest reported doses that produce effects by several routes of entry in various species, the Registry furnishes valuable information to those responsible for preparing safety data sheets for chemical substances in the workplace. Chemical and production engineers can use the Registry to identify the hazards which may be associated with chemical intermediates in the development of final products, and thus can more readily select substitutes or alternate processes which may be less hazardous. (p. xiii)

In this edition of the Registry, the editors intend to identify ''all known toxic substances'' which may exist in the environment and to provide pertinent data on the toxic effects from known doses entering an organism by any route described. Data may be used for the evaluation of chemical hazards in the environment, whether they be in the workplace, recreation area, or living quarters. (p. xiii)

''It must be reemphasized that the entry of a substance in the Registry does not automatically means that it must be avoided. A listing does mean, however, that the substance has the documented potential of being harmful if misused, and care must be exercised to prevent tragic consequences. (p. xiv)''

The RTECS 1978 printed edition may be purchased for $13.00 from the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, D.C. 20402 (202-783-3238) (Order GPO Stock No. 017-033-00346-7). Some employers may also desire to subscribe to the quarterly update to the RTECS which is published in a microfiche edition. An annual subscription to the quarterly microfiche may be purchased from the GPO for $14.00 (Order the ''Microfiche Edition, Registry of Toxic Effects of Chemical Substances''). Both the printed edition and the microfiche edition of RTECS are available for review at many university public libraries throughout the country. The latest RTECS editions may also be examined at the OSHA Technical Data Center, Room N2439-Rear, United States Department of Labor, 200 Constitution Avenue, N.W., Washington, D.C. 20210 (202-523-9700), or at any OSHA Regional or Area Office (*See,* major city telephone directories under United States Government — Labor Department).

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[1] On April 24, 1980, the Director of the *Federal Register* approved for incorporation by reference into 29 CFR 1910, the 1978 edition of the National Institute for Occupational Safety and Health Registry of Toxic Effects of Chemical Substances (the Registry). (See 29 CFR 1910.20 (c)(11)(ii)).

1910.22 — GENERAL REQUIREMENTS

	YES	NO
Are all work areas, including passageways, storage areas and service rooms maintained in a clean and orderly manner and free of debris? (a)(1)		
Are the floors of all workrooms being maintained in a dry condition? (a)(2)		
Are there wet processes being used? If so, is drainage provided, if possible? Are dry standing places provided, if possible? (a)(2)		
Are floors being kept free of protrusions that would prohibit proper and good cleaning methods? (a)(3)		
Is mechanical handling equipment in use in your work area? If so, are aisles, loading docks, doors and turning areas sufficiently wide for safe clearance? (b)(1)		
Are permanent aisles properly marked? (b)(1)		
Are covers or guardrails provided where there are open pits, tanks, vats, ditches, etc? (c)		
Do you store any materials in any area (other than a concrete slab on the ground level)? If so, is the load capacity, as determined by the building official, marked on plates or signs that would prohibit overloading? (See page 1-1 and 1-5.) (d)(1)		
Are storage areas overloaded? (d)(2)		

1910.23 — FLOOR AND WALL OPENINGS

(a) Protection for Floor Openings.

Are all stairway floor openings provided with standard railings or hinged covers, to prevent employees from falling through? On all exposed sides except at the entrance? (1)		
Are ladder openings provided with standard railings and toeboards? (2)		
Is access opening to ladder provided with a swinging gate or offset to prevent employees from walking directly into opening? (2)		
Are railings replaced or covers closed after use? (3)		
Are chute wall openings provided with protection for employees while chutes are in use? (3)		
Are employees exposed to skylights? Are railings or screens provided that will withstand a load of 200 lbs.? (4)		
Are hatchways, chutes, pits, trapdoors or manhole openings through the floor provided with a cover or a standard guard railing to prevent employees from falling through? (5)		
If railings cannot be used due to processes, are employees protected by other means? (5)		
Is every manhole floor opening guarded when open? (6)		
Is every floor opening into which persons can accidently walk protected by a cover? (7)-(9)		
Is a platform provided where doors or gates open directly on a stairway? (10)		
Is the effective width of the platform at least 20 inches with the door or gate open? (10)		

1910.23 — FLOOR AND WALL OPENINGS

(b) Protection for Wall Opening and Holes.

	YES	NO
Are wall openings with a drop of more than 4 feet provided with guards to prevent employees from falling through? (1)		
Are there any windows where the drop is more than 4 feet and the bottoms are less than 3 feet from a floor or landing? If so, are they equipped with slats or grillwork? (3)		
Are all temporary wall openings guarded? (4)		
Are all wall holes guarded to prevent material from falling off the edge? (5)		

(c) Protection of Open-sided Floors, Platforms and Runways.

Are open-sided floors or platforms more than 4 feet high provided with railings? (1)		
Are railings as above provided with toeboards wherever persons pass beneath? When there is moving machinery or where falling material can create a hazard? (1)		
Are runways more than 4 feet above any level guarded by railings? (2)		
Are standard railings provided where open-sided floors, walkways, platforms, or runways are above or adjacent to dangerous equipment, pickling or galvanizing tanks, degreasing units, etc? (3)		

NOTE: Do all railings have a top rail height of 42 inches? Is there a midrail halfway between the top rail and the walking surface? Are toeboards at least 4 inches high?

(d) Stairway Railings and Guards.

Is every flight of stairs with 4 or more risers equipped with handrails? (1)		
Is at least one handrail provided on stairways less than 44 inches wide with both sides enclosed? (1)(i)		
Is a stair railing provided on the open side of stairways less than 44 inches wide? (1)(ii)		
Are stair railings provided on both sides of stairways when both sides are open and the stairs are less than 44 inches wide? (1)(iii)		
Is there one handrail on each enclosed side of stairways having a width between 44 and 88 inches? (1)(iv)		
Are stairways more than 88 inches wide equipped with: One handrail on each enclosed side? One stair railing on each open side? One stair railing in the center of the stairway? (1)(v)		
Are means provided on winding stairs so that useable portions of treads are at least 6 inches? (2)		

(e) Railing, Toeboards and Cover Specifications.

Do all standard railings consist of a top rail, midrail? (1)		
Is the top rail 42 inches above the walking surface? (1)		
Is the midrail halfway between the top rail and walking surface? (1)		

1910.23 – FLOOR AND WALL OPENINGS

YES NO

Are stair railings not more than 34 inches nor less than 30 inches to the surface of the stair tread? **(2)**

Are pipe railings 1½ inches nominal diameter with posts spaced not more than 8 feet apart? **(3)(ii)**

Are structural steel railings at least 2 inches by 2 inches by ⅜ inch angles with posts spaced not more than 8 feet apart? **(3)(iii)**

Are posts of sufficient size and anchored in such a manner that they will withstand a 200 lb load in any direction? **(3)(iv)**

Do other types of railing construction meet the following requirements:

A smooth-surface top rail at a height above floor, platform, runway, or ramp level of 42 inches nominal;

Strength to withstand at least the minimum of 200 pounds top rail pressure; and

Protection between top rail and floor, platform, runway, ramp, or stair treads, equivalent to the protection provided by a standard intermediate rail? **(3)(v)(a-c)**

Is the standard toeboard 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp?

Is the toeboard securely fastened in place and with not more than 1/4 inch clearance above floor level?

Is the toeboard made of substantial material, either solid or with openings not over 1 inch in dimension? **(4)**

Does the handrail have a lengthwise member mounted directly on a wall or partition by means of brackets attached to the lower side of the handrail? **(5)(1)**

Do all handrails and railings have a clearance of not less than 3 inches between the handrail or railing and any other object? **(6)**

When located in plant roadways, are trench or conduit covers and their supports, designed to carry a truck rear-axle load of at least 20,000 pounds? **(7)(i)**

Are manhole covers designed to carry a truck rear-axle load of at least 20,000 pounds? **(7)(ii)**

Are skylight screens constructed and mounted so that they are capable of withstanding a load of at least 200 pounds? **(8)**

Are wall opening barriers constructed and mounted so that, when in place at the opening, the barrier is capable of withstanding a load of at least 200 pounds? **(9)**

Are wall opening grab handles not less than 12 inches in length and mounted as to give 3 inches clearance from the side framing of the wall opening? **(10)**

Are wall opening screens constructed and mounted so that they are capable of withstanding a load of at least 200 pounds? **(11)**

[Published in Federal Register 6/27/74, amended 8/10/84.]

1910.24 – FIXED INDUSTRIAL STAIRS

YES NO

(b) Where Fixed Stairs are Required.

Are stairs provided where there is a change in structure level?

Are stairs provided for access to operating platforms on equipment requiring routine attention?

Are stairs provided to elevations where there is an exposure to caustics, gases, etc?

Are stairs provided as access to elevations where tools and materials are required to be carried by hand?

(c) Stair Strength.

Are fixed stairs designed and constructed to carry a load of 5 times the anticipated normal live load and at least a moving concentrated load of 1,000 lbs?

(d) Stair Width.

Are fixed stairs at least 22 inches wide?

(e) Angle of Rise.

Are fixed stairs installed so as to have an angle between 30° and 50° from the horizontal? (See Table D-1, page D-App-1)

(f) Stair Treads.

Are stair treads equipped with reasonable slip resistance surfaces?

[Published in Federal Register 6/27/74, amended 8/10/84.]

(g) Stairway Platforms.

Are platforms provided on long flights of stairs at least as wide as the stairs? Are these platforms at least 30 inches long?

(h) Railings and Handrails.

Are stairs provided with the required railings?

(i) Vertical Clearance.

Are there any stairs without at least a vertical clearance of 7 feet?

(j) Standard Removed by OSHA.

Do you require that all purchased wood ladders be built to specifications contained in American National Standards Institute A-14.1-1968?

1910.25 — PORTABLE WOOD LADDERS

Application of Requirements

Note: This section is intended to prescribe rules and establish minimum requirements for the construction, care, and use of the common types of portable wood ladders, in order to insure safety under normal conditions of usage. Other types of special ladders, fruit-picker's ladders, combination step and extension ladders, stockroom step ladders, aisle-way step ladders, shelf ladders, and library ladders are not specifically covered by this section. **(a)**

DEFINITIONS — SUBPART D

Bearer. A horizontal member of a scaffold upon which the platform rests and which may be supported by ledgers.

Boatswain's chair. A seat supported by slings attached to a suspended rope, designed to accommodate one person in a sitting position.

Brace. A tie that holds one scaffold member in a fixed position with respect to another member.

Bricklayers' square scaffold. A scaffold composed of framed wood squares which support a platform limited to light and medium duty.

Cage (or basket guard). An enclosure that is fastened to the side rails of the fixed ladder or to the structure to encircle the climbing space of the ladder for the safety of the person climbing the ladder.

Carpenters' bracket scaffold. A scaffold consisting of wood or metal brackets supporting a platform.

Cleats. Ladder crosspieces of rectangular cross-section placed on edge.

Climbing ladder. A separate ladder with equally spaced rungs usually attached to the scaffold structure for climbing and descending.

Coupler. A device for locking together the component parts of a tubular metal scaffold.

Crawling board or chicken ladder. A plank with cleats spaced and secured at equal intervals, for use by a worker on roofs, not designed to carry any material.

Double pole or independent pole scaffold. A scaffold supported from the base by a double row of uprights, independent of support from the walls and constructed of uprights, ledgers, horizontal platform bearers, and diagonal bracing.

Extension ladder. A non-self-supporting portable ladder, adjustable in length, that consists of two or more sections traveling in guides or brackets.

Extension trestle ladder. A self-supporting portable ladder, adjustable in length, consisting of a trestle ladder base and a vertically adjustable single ladder, with suitable means for locking the ladders together.

Fastenings. Devices to attach a ladder to a structure, building, or equipment.

Fixed ladder. A ladder permanently attached to a structure, building, or equipment.

Float or ship scaffold. A scaffold hung from overhead supports by means of ropes and consisting of a substantial platform having diagonal bracing underneath, resting upon and securely fastened to two parallel plank bearers at right angles to the span.

Floor hole. An opening measuring less than 12 inches but more than 1 inch in its least dimension, in any floor, platform, pavement, or yard; such as a belt hole, pipe opening, or slot opening.

Floor opening. An opening measuring 12 inches or more in its least dimension, in any floor, platform, pavement, or yard, through which persons may fall; such as a hatchway, stair or ladder opening, pit, or large manhole.

Grab bars. Individual handholds placed adjacent to or as an extension above ladders for the purpose of providing access beyond the limits of the ladder.

Guardrail. A rail secured to uprights and erected along the exposed sides and ends of platforms.

Handrail. A single bar or pipe supported on brackets from a wall or partition, as on a stairway or ramp, to furnish a handhold in case of tripping.

Heavy duty scaffold. A scaffold designed and constructed to carry a working load not to exceed 75 pounds per square foot.

Horse scaffold. A scaffold for light or medium duty, composed of horses supporting a work platform.

Individual-rung ladder. A fixed ladder, each rung of which is individually attached to a structure, building, or equipment.

Interior hung scaffold. A scaffold suspended from the ceiling or roof structure.

Ladders. A ladder usually consists of two side rails joined at regular intervals by crosspieces called steps, rungs, or cleats.

Ladder jack scaffold. A light duty scaffold supported by brackets attached to ladders.

Ladder safety device. Any device, other than a cage or well, designed to eliminate or reduce the possibility of accidental falls and which may incorporate such features as life belts, friction brakes, and sliding attachments.

Ladder stand. A mobile fixed size self-supporting ladder consisting of a wide flat tread ladder in the form of stairs. The assembly may include handrails.

Ledger (stringer). A horizontal scaffold member which extends from post to post and which supports the putlogs or bearer forming a tie between the posts.

Light duty scaffold. A scaffold designed and constructed to carry a working load not to exceed 25 pounds per square foot.

Manually propelled mobile scaffold. A portable rolling scaffold supported by casters.

Masons' adjustable multiple-point suspension scaffold. A scaffold having a continuous platform supported by bearers suspended by wire rope from overhead supports, so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

Maximum intended load. The total of all loads including the working load, the weight of the scaffold, and such other loads as may be reasonably anticipated.

Medium duty scaffold. A scaffold designed and constructed to carry a working load not to exceed 50 pounds per square foot.

Mid-rail. A rail approximately midway between the guardrail and platform, and secured to the uprights erected along the exposed sides and ends of platforms.

Mobile. "Manually propelled."

Mobile scaffold (tower). A light, medium, or heavy-duty scaffold mounted on casters or wheels.

Mobile work platform. Generally a fixed work level one frame high on casters or wheels, with bracing diagonally from platform to vertical frame.

Needle beam scaffold. A light duty scaffold consisting of needle beams supporting a platform.

Nose, nosing. That portion of a tread projecting beyond the face of the riser immediately below.

Open riser. The air space between the treads of stairways without upright members (risers).

Outrigger scaffold. A scaffold supported by outriggers or thrustouts projecting beyond the wall or face of the building or structure, the inboard ends of which are secured inside of such a building or structure.

Pitch. The angle between the horizontal and the ladder, measured on the opposite side of the ladder from the climbing side (always less than 90°).

Platform. A working space for persons, elevated above the surrounding floor or ground. Also an extended step or landing on a stairway.

Platform ladder. A self-supporting ladder of fixed size with a platform provided at the working level.

Putlog. A scaffold member upon which the platform rests.

Rail ladder. A fixed ladder consisting of side rails joined at regular intervals by rungs or cleats and fastened in full length or in sections to a building, structure, or equipment.

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Railing. A vertical barrier erected along exposed sides of stairways and platforms to prevent falls of persons. The top of a railing usually serves as a handrail.

Rise. The vertical distance from the top of a tread to the top of the next higher tread.

Riser. The upright member of a step situated at the back of a lower tread and near the leading edge of the next higher tread.

Roofing bracket. A bracket used in sloped roof construction, having provisions for fastening to the roof or supported by ropes fastened over the ridge and secured to some suitable object.

Rungs. Ladder crosspieces of circular or oval cross-section on which a person may step.

Runner. The lengthwise horizontal bracing or bearing members or both.

Runway. A passageway for persons, elevated above the surrounding floor or ground level, such as a footwalk along shafting or a walkway between buildings.

Scaffold. Any temporary elevated platform and its supporting structure used for supporting workers or materials or both.

Sectional ladder. A non-self-supporting portable ladder, nonadjustable in length, consisting of two or more sections that may be combined to function as a single ladder.

Side-rolling ladder. A semifixed ladder, nonadjustable in length, supported by attachments to a guide rail, which is generally fastened to shelving.

Side-step ladder. A ladder from which a person getting off at the top must step sideways in order to reach the landing.

Single ladder. A portable ladder, nonadjustable in length, consisting of but one section.

Single-point adjustable suspension scaffold. A manually or power-operated unit designed for light duty use, supported by a single wire rope from an overhead support so arranged and operated as to permit the raising or lowering of the platform to desired working positions.

Single-pole scaffold. Platforms resting on putlogs or crossbeams, the outside ends of which are supported on ledgers secured to a single row of posts or uprights and the inner ends of which are supported on or in a wall.

Stairs, stairway. A series of steps leading from one level or floor to another. A series of steps and landings having three or more risers constitutes stairs or stairway.

Standard railing. A vertical barrier erected along exposed edges of a floor opening, wall opening, ramp, platform, or runway to prevent falls of persons.

Stepladder. A self-supporting portable ladder, nonadjustable in length, having flat steps and a hinged back.

Steps. Flat crosspiece of a ladder on which a person may step.

Stone setters' adjustable multiple-point suspension scaffold. A swinging-type scaffold having a platform supported by hangers suspended at four points so as to permit the raising or lowering of the platform to the desired working position by the use of hoisting machines.

Through ladder. A ladder through which a person getting off at the top must step in order to reach the landing.

Toeboard. A vertical barrier at floor level erected along exposed edges of a floor opening, wall opening, platform, runway, or ramp to prevent falls of materials.

Tread. The horizontal member of a step.

Tread run. The horizontal distance from the leading edge of a tread to the leading edge of an adjacent tread.

Tread width. The horizontal distance from front to back of tread including nosing when used.

Trestle ladder. A self-supporting portable ladder, nonadjustable in length, consisting of two sections hinged at the top to form equal angles with the base.

Trolley ladder. A semifixed ladder, nonadjustable in length, supported by attachments to an overhead track.

Tube and coupler scaffold. An assembly consisting of tubing which serves as posts, bearers, braces, ties, and runners, a base supporting the posts, and special couplers which connect the uprights and join the various members.

Tubular welded frame scaffold. A sectional, panel, or frame metal scaffold substantially built up of prefabricated welded sections which consist of posts and horizontal bearer with intermediate members. Panels or frames shall be braced with diagonal or cross braces.

Two-point suspension scaffold (swinging scaffold). A scaffold, the platform of which is supported by hangers (stirrups) at two points, suspended from overhead supports so as to permit the raising or lowering of the platform to the desired working position by tackle or hoisting machines.

Wall hole. An opening less than 30 inches but more than 1 inch high, of unrestricted width, in any wall or partition; such as a ventilation hole or drainage scupper.

Wall opening. An opening at least 30 inches high and 18 inches wide, in any wall or partition, through which persons may fall.

Well. A permanent complete enclosure around a fixed ladder, attached to the walls of the well, which will give the person who must climb the ladder the same protection as a cage.

Window jack scaffold. A scaffold, the platform of which is supported by a bracket or jack which projects through a window opening.

Work level. The elevated platform, used for supporting workers and materials, comprising necessary vertical, horizontal, and diagonal braces, guardrails, and ladder for access to the platform.

Working load. Load imposed by workers, materials, and equipment.

1910.25 — PORTABLE WOOD LADDERS

YES NO

(b) Materials

Requirements Applicable to All Wood Parts

Are all wood parts:

- Free from sharp edges and splinters; (b)(1)
- Sound and free from accepted visual inspection from shake, wane, compression failures, decay or other irregularities? (b)(1)

Are low density woods not used? (b)(1)

(c) Construction Requirements

[RESERVED] (1)

Portable Stepladders

Are stepladders longer than 20 feet not used? (c)(2)

Note: Stepladders as hereinafter specified shall be of three types:

Type I. Industrial stepladder, 3 to 20 feet for heavy duty, such as utilities, contractors and industrial use.

Type II. Commercial stepladder, 3 to 12 feet for medium duty, such as painters, offices, and light industrial use.

Type III. Household stepladder, 3 to 6 feet for light duty, such as light household use. (c)(2)

General Requirements

[RESERVED] (C)(2)(i)(a)

Is uniform step spacing employed which is not more than 12 inches? (c)(2)(i)(b)

Are steps parallel and level when the ladder is in position for use? (c)(2)(i)(b)

Is the minimum width between side rails at the top, inside to inside, not less than 11½ inches? (c)(2)(i)(c)

Are the side rails, from top to bottom, spread at least 1 inch for each foot of length of stepladder? (c)(2)(i)(c)

[RESERVED] (c)(2)(i)(d-e)

Is a metal spreader or a locking device of sufficient size and strength to securely hold the front and back sections in open positions a component of each stepladder? (c)(2)(i)(f)

Does the spreader have all sharp points covered or removed to protect the user? (c)(2)(i)(f)

For Type III ladders, is the pail shelf and spreader combined in one unit (the so-called shelf-lock ladder)? (c)(2)(i)(f)

Portable Rung Ladders

[RESERVED] (c)(3)(i)

Are single ladders longer than 30 feet not used? (c)(3)(ii)

Are two-section extension ladders longer than 60 feet not used? (c)(3)(iii)

1910.25 — PORTABLE WOOD LADDERS

YES NO

Do all ladders of this type consist of two sections, one to fit within the side rails of the other, and arranged in such a manner that the upper section can be raised and lowered? (c)(3)(iii)

Are assembled combinations of sectional ladders longer than lengths specified in this subdivision not used? (c)(3)(iv)

Are trestle ladders, or extension sections or base sections of extension trestle ladders longer than 20 feet not used? (c)(3)(v)

Special-Purpose Ladders

[RESERVED] (c)(4)(i)

Are painter's stepladders longer than 12 feet not used? (c)(4)(ii)

Are mason's ladders, (used in heavy construction work), longer than 40 feet not used? (c)(4)(iii)(a)

Are trolley and side rolling ladders longer than 20 feet not used? (c)(5)(i)

(d) Care and Use of Ladders.

Are there internal ladder inspection procedures established that will preclude the use of unsafe ladders? (1)(i)

Do these inspections include extension ladders, and step ladders? (1)(i)

Are joints between steps and side rails tight? (1)(i)

Are hardware and fittings securely attached? (1)(i)

Are all metal bearings of locks, wheels, pulleys, etc. lubricated? (1)(ii)

Is the rope on extension ladders in good condition? (1)(iii)

Are ladders equipped with safety feet? Are safety feet securely attached and in good condition? (1)(iv)

Are ladders frequently inspected? Are those found defective tagged as "Dangerous, Do Not Use" and withdrawn from service? (1)(x)

Are wood straight ladders used at the proper angle? (2)(i)

NOTE: The rule is that the proper angle can be determined by insuring that the foot of the ladder is placed so that it is one-quarter of the distance away from the vertical plane as the ladder is long when it rests at the top of the vertical plane. Ex. — If the ladder is resting on an object 16 feet high, the foot should be placed 4 feet away from the bottom of the vertical plane.

Are ladders so placed to prevent slipping? If not, are they lashed or held in position while in use? (2)(i)

Do you prohibit the use of a ladder by more than 1 person at one time? (2)(ii)

Do you require that straight ladders have secure footing prior to use? (2)(iii)

Do you require that the top support for the ladder is sufficiently strong and rigid? (2)(iii)

1910.25 — PORTABLE WOOD LADDERS

YES NO

Do you prohibit placing ladders in front of door openings toward the ladder that do not have doors blocked open, locked or attended by another employee? (2)(iv)

Do you prohibit the placing of ladders on unstable bases such as boxes? (2)(v)

Are employees prohibited from using ladders that have defective parts, i.e., broken steps, split siderails? (2)(viii)

Do you prohibit the splicing of short ladders to make one of a longer dimension? (2)(ix)

Do you prohibit the use of ladders for other than their intended use, i.e., bracing, skid, etc.? (2)(xi)

Do you prohibit employees from standing on the top step of a step ladder? (2)(xii)

When two-section extension ladders are used, do you require that the minimum overlap of the section be as follows:

Up to 36′ in length	3 feet?	
36′ to 48′	4 feet?	
48′ to 60′	5 feet?	(2)(xiii)

When side rails of wood ladders are equipped with metal reinforcing, do you require that the reinforcing material be placed on the side away from the climbing side? (2)(xiv)

When using ladders to gain access to roofs, do you require that the side rails extend at least 36 inches above the upper landing surface? (2)(xv)

Are middle and top sections of sectional ladders ever used as the bottom section? If so, are they equipped with safety shoes? (2)(xvii)

When using portable straight ladders in slippery areas, are safety shoes provided? Even if safety shoes are provided, do you require that ladders be lashed or held by another employee when the surface is oily, or on metal or concrete surfaces? (2)(xix)

Do you prohibit the climbing on back support of step ladders by employees? (2)(xx)

[Published in Federal Register 6/27/74, amended 8/10/84]

1910.26 — PORTABLE METAL LADDERS

(a) General Requirements.

Are all ladders free from structural defects or accident hazards such as sharp objects? (1)

Is the metal selected strong enough to meet test requirements?

Is the metal protected from corrosion? (1)

Is the spacing of rungs or steps on 12 inch centers? (1)

Are rungs and steps corrugated or treated with non-skid material so employees won't slip? (1)

Are straight ladders built with at least 12 inches between side rails? (2)(i)

Are single ladders built not to exceed 30 feet in length?

Are two-section ladders built not to exceed 48 feet in length?

1910.26 — PORTABLE METAL LADDERS

YES NO

Are ladders with over 2 sections built not to exceed 60 feet in length? (2)(ii)

When using extension ladders, do your require the following as a minimum overlap between sections?

Up to 36 feet length	3 feet	
36 feet to 48	4 feet	
48 feet to 60	5 feet	(2)(iii)

Are positive stops provided on extension ladders to insure the overlap as indicated above? (2)(iv)

Step ladders do not exceed 20 feet in length. (3)

Do the bottoms of the four rails have insulating, non-skid material to protect employees? (3)

Is there a locking device or metal spreader strong enough to hold the front and back section of a step ladder open? (3)

Trestle or extension ladders are not more than 20 feet in length. (4)

Platform ladders are not more than 20 feet in length. (5)

[RESERVED] (b)

(c) Care of Ladders.

Are all ladders maintained in good usable condition? (1)

If a ladder is tipped over, are the sides inspected for dents or bends? (2)(a)

Are ladders cleaned if they are exposed to oil and grease? (2)(d)

Are ladders with defects marked and taken out of service until repaired? (2)(vii)

Are portable ladders designed as one-person working ladders based on a 200 pound load? (3)

NOTE: The rule is that the proper angle can be determined by insuring that the foot of the ladder is placed so that it is 1/4 the distance away from the vertical plane as the ladder is long where it rests at the top of the vertical plane.

Ex. — If the ladder is resting on an object 16 feet high, the foot should be placed 4 feet away from the bottom of the vertical plane. (3)(i)

Are portable ladders used by only one employee at a time? (3)(ii)

Does the base section of portable ladders have secure footing? (3)(iii)

Unless equipped with a single support attachment, is the top of the ladder supported with two rails? (3)(iv)

Are climbers always facing the ladder when ascending or descending? (3)(v)

Ladders are not tied or fastened together to provide longer sections. (3)(vi)

Ladders are not used as a brace, skid, guy, gin pole, or gangway, unless specifically recommended by the manufacturer. (3)(vii)

1910.26 — PORTABLE METAL LADDERS

	YES	NO
Are users cautioned to take proper safety measures when metal ladders are used in areas containing electric circuits to prevent short circuits or electric shock? [see 1910.333(c) for work practices to be used when work is performed on or near electric circuits.] **(3)(viii)**		

1910.27 — FIXED LADDERS

(a) Design Requirements.

	YES	NO
Are ladders designed for a minimum single live load of 200 pounds? **(1)(i)**		
Are considerations given for additional concentration of 200 pound live loads if the use of such is anticipated? **(1)(ii)**		
Is the weight of the ladder and all appurtenances, together with the live load anticipated, considered in the design of the ladder? **(1)(iv)**		
Are the design stresses for wood components of fixed ladders in accordance with the requirements of American National Standards Institute A-14.1-1968 Safety Code for portable wood ladders? **(2)**		

(b) Specific Features — Rungs and Cleats.

	YES	NO
Do all metal rungs have a minimum diameter of at least 3/4" except those that are imbedded in concrete which shall have a minimum diameter of 1 inch or treated to resist corrosion or rusting? **(1)(i)**		
Are wood rungs at least 1⅛ inches in diameter? **(1)(i)**		
Are the rungs spaced no more than 12 inches on centers? **(1)(ii)**		
Are rung spacings uniform throughout the length of the ladder? **(1)(ii)**		
Are the rungs at least a minimum of 16 inches in length? **(1)(iii)**		
Are rungs free of splinters, sharp edges, burrs, or projections that may create a hazard? **(1)(iv)**		
Are rungs of individual-rung ladders designed so that the foot cannot slip off? (See Fig. D-1*) **(1)(v)**		
Do side rails that can be used as a climbing aid provide sufficient cross sections to afford adequate gripping and are they free of sharp edges? **(2)**		
Are fastenings an integral part of the design of the ladder? **(3)**		
Do splices meet the design criteria of the live load requirements? **(4)**		
Are adequate means provided to prevent electrolytic action when dissimilar metals are used? **(5)**		
Are all weldments in accord with the American Welding Society Code for Welding in Building Construction (AWSD 1.0-1966)? **(6)**		
Are metal ladders painted or otherwise treated to resist corrosion and rusting? **(7)(i)**		

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*See Self-Inspection Appendix

1910.27 — FIXED LADDERS

	YES	NO
Are wood fixed ladders treated to prevent decaying? **(7)(ii)**		
Is the preservative used non-injurious to using employees? **(7)(ii)**		

(c) Ladder Clearance.

	YES	NO
Are ladders installed at 90° to the horizontal provided with at least 30° inches space between the ladder and any permanent object on the climbing side? **(1)**		
Are those installed at a 76 pitch provided with at least 36 inches clearance between the ladder rungs and any permanent object on the climbing side? **(1)**		
NOTE: If ladders are equipped with cage or basket guards the above two items are not required.		
Is there a clear width of at least 15 inches provided on each way from the center of rungs? **(2)**		
NOTE: Does not apply to ladders equipped with cages or walls.		
Is there 7 inches of space behind the ladder rungs? **(4)**		
If there are obstructions behind the ladder that encroach on the 7 inch requirement, is ladder constructed as shown in Fig. D-3*? **(4)**		
Are any fixed ladders equipped with grab bars installed adjacent to, or above a ladder to provide a hand hold beyond the limits of the ladder? **(5)**		
If so, do they have at least 4 inches of clearance behind them? **(5)**		
Are they so installed that they are behind the vertical plane of the rungs? **(5)**		
Is the step-acoss distance from the ladder at least 2½ inches or not more than 12 inches from the upper landing surface? **(6)**		
Do counterweigthed hatch covers open at least 60° from the horizontal? **(7)**		
Is there at least 24 inches of clearance between the rungs and the hatch opening on offset walls? (30 inches on straight walls). **(7)**		
Are deflector plates installed at a 60° angle from the horizontal, where there is protruding equipment within 24 inches of the rungs on the climbing side? **(7)**		
NOTE: See Fig. D-5* and D-6*.		

(d) Special Requirements — Cages or Wells.

	YES	NO
Are cages built as shown in Fig D-8 and Fig. D-9*? **(1)(i)**		
Are ladder wells constructed as shown in Fig D-7?* **(1)(i)**		
Are cages provided on all ladders that are more than 20 feet to an unbroken length of 30 feet in length? **(1)(ii)**		
Do cages extend at least 42 inches above the upper landing surface? **(1)(iii)**		
Do cages extend to not less than 7 feet or more than 8 feet from the lower landing surface? **(1)(iv)**		

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*See Self-Inspection Appendix

1910.27 — FIXED LADDERS

YES NO

Are cages equipped with a flare at the bottom of not less than 4 inches? (1)(iv)

Are cages so installed that the distance from the ladder rungs is not less than 27 inches or more than 28 inches from the cage vertical bars? (1)(v)

Are cages at least 27 inches in width? (1)(v)

Is the inside of cages free of obstruction along its entire height? (1)(v)

Do ladder wells have a clear width of 15 inches each way from the center of the rungs? (1)(vi)

Are ladder well walls smooth-sided along the entire distance? If so, is there at least 27 inches clearance on the climbing side of the ladder? (1)(vi)

Are there any projections in ladder wells? If so, is there at least 30 inches clearance between the centerline of the rungs and the obstruction? (1)(vi)

Are there landing platforms provided at each 30′ level (chimneys excepted) on ladders with cages, wells or ladder safety device? (2)

On ladders without cages, wells or ladder safety devices, are platforms at each 20 foot height? (2)

Is a landing platform provided where the distance from the centerline of the ladder wing to the nearest edge of a structure or equipment is in excess of 12 inches? (2)(i)

Is the minimum step-across distance 2½ inches? (2)(i)

Are the landing platforms equipped with standard railings? (2)(ii)

Are the platforms at least 24 inches wide by 30 inches in length? (2)(ii)

Is the top rung of any section of the ladder at the same level as the top landing platform? (2)(iii)

On through access ladders, does the first rung below the level of entry have the same spacing as all the rungs of the ladder? (2)(iii)

Do side rails of through or side-step ladders extend 3½ feet above the landing? (3)

Are the extensions on step-through ladders between 18 and 24 inches wide? (3)

On offset or side-step ladders do rungs extend at least 3½ feet above the landing or offset? (See Fig. D-10*) (3)

Do horizontal ladder grab bars at the upper landing have the same spacing as the ladder rungs? (4)

Do vertical ladder grab bars at the upper landing have the same spacing as the ladder side rails? (4)

Are ladder safety devices used on tower, water tank or chimney ladders over 20 feet in unbroken length? (5)

NOTE: Platforms are not required when such devices are used.

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*See Self-Inspection Appendix

1910.27 — FIXED LADDERS

YES NO

(e) Pitch

Is the pitch of all fixed ladders between 75° and 90° with the horizontal? (1)

Are substandard pitch ladders (those with a pitch of 60 to 75 degrees) prohibited except as *absolutely* necessary? (2)

Are ladders with a pitch in excess of 90° from the horizontal prohibited? (4)

(f) Maintenance.

Do you have an established procedure for fixed ladder inspection?

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

(a) General Requirements.

Are all operations that cannot be performed from ground or structural level accomplished from scaffolds or approved ladders? (1)

Are scaffolds erected on sound footings? (2)

Is the use of unstable objects prohibited for footings? (2)

Are guardrails at least equivalent to 2 × 4 inches? (3)

Are they between 36 to 42 inches in height? (3)

Are posts installed at no more than 10 feet intervals? (3)

Are toeboards a minimum of 4 inches high? (3)

Are scaffolds erected with a safety factor of at least four? (4)

Are scaffolds in use maintained in a safe condition? (5)

Are employees prohibited from altering or moving scaffolds which are occupied? (5)

Are damaged scaffolds or parts thereof removed from service? (6)

Are scaffold loads within the limitation of the intended loads? (7)

Are all load-carrying timbers in framing of 1500*f.* (Stress Grade) construction grade lumber? (9)

The maximum permissible spans for 2 × 9 or wider planks are shown in the following table:

	Material				
	Full thickness undressed lumber			Nominal thickness lumber	
Working load (p.s.f.)	25	50	75	25	50
Permissible span (ft.)	10	8	6	8	9

Are nails or bolts used for construction of adequate size? (10)

Are nails driven in their full length? (10)

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*See Self-Inspection Appendix

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Are scaffold planks overlapped at least 12 inches or secured? (11)		
Is a ladder provided to gain access to scaffold working levels? (12)		
Do planks extend over their supports by at least 6 inches, but not more than 18 inches? (13)		
Are scaffold poles or uprights plumb? (14)		
Are they ridgidly braced? (14)		
Do materials being hoisted onto a scaffold have a tag line? (15)		
Are employees working on a scaffold protected from overhead hazards? (16)		
Is a screen provided between the toeboard and toprail, on scaffolds where other employees are working or passing under the scaffold? (17)		
Is screen of No. 18 gauge wire with ½ inch openings or equivalent? (17)		
Are employees prohibited from working on scaffolds during storms or high winds? (18)		
Are employees prohibited from using scaffolds covered with ice or snow? (19)		
Are tools, material, and debris removed from scaffold to prevent an accumulation of same? (20)		
Is treated or protected fiber rope used on scaffolds where exposure to corrosives or chemicals is present? (21)		
Does wire or fiber used in scaffold supports have a safety factor of at least 6? (22)		
Is wire rope used in supporting scaffolds when using acid solutions in cleaning buildings more than 50′ high? (23)		
Is the use of shore or lean-to scaffolds prohibited? (24)		
Are scaffolds built around structures, secured to the structures? (26)		
Is the use of window cleaners' anchor bolts prohibited for this purpose? (26)		
(b) Wood Pole Scaffolds.		
Are poles provided with bearing plates that cover a sufficient area to prevent settling? (1)		
Are poles set plumb? (1)		
Are spliced ends of poles squared? (2)		
Does upper section rest squarely on lower section? (2)		
Are splice plates provided on at least 2 adjacent sides? (2)		
Are splice plates at least 4 feet long? (2)		
Do splice plates overlap abutted ends of pole equally? (2)		
Are splice plates of the same width as the poles? (2)		
Are independent pole scaffolds set as near to building as practicable? (3)		
Are pole scaffolds securely guyed or tied to the building or structure? (4)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Are scaffolds higher than 25 feet secured at intervals of 25 feet vertically **and** horizontally? (4)		
Are putlogs or bearers set with their greater dimension vertical? (5)		
Do they project over the ledgers by at least 3 inches? (5)		
On single pole scaffolds, are wood putlogs reinforced with a $\frac{3}{16}$ × 2 inch steel strip (or equivalent) on the underside along their entire length? (6)		
Are ledgers long enough to extend over 2 pole spaces? (7)		
Do you prohibit splicing of ledgers between poles? (7)		
Are ledgers reinforced by bearing blocks securely nailed to sides of poles? (7)		
Is diagonal bracing provided to prevent movement and buckling? (8)		
Is cross bracing provided between inner and outer sets of poles on independent pole scaffolds? (9)		
Are free ends of poles cross-braced? (9)		
Is the entire face of pole scaffolds provided with full diagonal face bracing? (10)		
Are diagonal bracing splices at poles only? (10)		
Are platform planks laid with edges close together with no space between them? (11)		
Do planks overlap each other at ends by at least 12 inches? (12)		
Are planks installed with ends abutting to form a flush floor? (12)		
If so, is the butt joint at the centerline of poles? (12)		
Do abutted ends rest on separate bearers? When deflection of planks is possible, are intermediate beams installed? (12)		
Where deflection of planks is possible, due to leading, are plank ends nailed or cleated? (12)		
When a scaffold turns a corner, are planks laid so as to prevent tipping? (13)		
Are planks that meet a diagonal corner putlog at an angle, laid first? (13)		
Are planks placed over the diagonal putlog to have a safe bearing surface yet not so far as to allow tipping? (13)		
Are planks running in the opposite direction at right angles then properly placed in the first plank installed? (13)		
When moving platform levels up, are planks left in place until the next level of bearers has been set in place? (14)		
Are guardrails and toeboards installed on all open sides of scaffolds more than 10′ high? (15)		
Do guardrails have a strength equal to 2 × 4 lumber? (15)		
Do the boards extend above the working surface by at least 4 inches? (15)		
Is a screen provided between the toeboard and toprail where other employees are passing or working under the scaffold? (15)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Is the screen of No. 18 wire gauge with ½ inch openings or its equivalent? (15)		
Are wood pole scaffolds less than 60 feet high constructed in accordance with tables D-7* through D-12*? (16)		
Are wood pole scaffolds over 60 feet high designed by a registered professional engineer? (16)		
Are plans available for inspection? (16)		
Is the height of wood pole scaffold limited to the reach of local fire fighting equipment? (17)		
(c) Tube and Coupler Scaffolds.		
Do light-duty tube and coupler scaffolds have metal posts, bearers, runners and bracing of at least 2-inch O.D. steel tubing or its equivalent? (1)		
Are posts on light-duty scaffolds no more than 6 feet apart by 10 feet along the length of the scaffold? (1)		
Do medium-duty and coupler scaffolds have posts, runners and bracing of at least 2-inch O.D. steel tubing or its equivalent? (2)		
Are bearers on medium-duty scaffolds with posts spaced not more than 6 feet apart by 8 feet along the length of the scaffold made of 2½-inch O.D. steel tubing or its equivalent? (2)		
Are bearers on medium-duty scaffolds with posts spaced not more than 5 feet apart by 8 feet along the length of the scaffold made of 2-inch O.D steel tubing or its equivalent? (2)		
Do heavy-duty tube and coupler scaffolds have posts, runners and bracing of at least 2-inch steel tubing or its equivalent? (3)		
Is the post spacing on heavy-duty tube and coupler scaffolds not more than 6 feet apart by 6 feet 6 inches along the length of the scaffold? (3)		
Are tube and coupler scaffolds limited in height and working levels as set forth in tables D-13, 14 and 15? (see Appendix)		
For heights exceeding those in tables D-13, 14 and 15* are drawings and specifications designed by a registered professional engineer? (4)		
If so, are drawings available for inspection? (4)		
Are all tube and coupler scaffolds erected by competent and experienced personnel? (6)		
Are posts accurately spaced, erected on suitable bases and maintained plumb? (7)		
Do runners erected along the length of the scaffold on both inside and outside posts have the same height for each platform level? (8)		
Are all runner lengths interlocked? (8)		
Are all runners connected to all posts? (8)		
Are bottom runners placed as close to the base of posts as possible? (8)		
Is the spacing of runners for different levels of platforms maintained at not more than 6 feet 6 inches on centers? (8)		

*See Self-Inspection Appendix

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Are bearers installed transversely at posts only? (9)		
Are bearers securely coupled to posts? If so, are they kept as close to posts as practicable? (9)		
Are bearers at least 4 inches but not more than 12 inches longer than post spacing? (10)		
Is cross bracing installed at least on every third set of posts horizontally? (11)		
Is cross bracing installed at least every fourth runner vertically? (11)		
Are they securely attached to posts or runners? (11)		
Is longitudinal diagonal bracing installed at a 45° angle on the outer face of the scaffolding? (12)		
Does the longitudinal bracing extend from the first (right hand) post to the extreme top of the scaffold? (12)		
Is longitudinal length of scaffold sufficiently long to duplicate bracing at each fifth post? (12)		
If so, is it so provided? (12)		
Is longitudinal diagonal bracing installed oppositely? That is, starting at bottom of last (left hand) post extending back and upward toward top of the first (right hand) post. (12)		
Is longitudinal diagonal bracing secured to posts? (12)		
Is entire scaffold tied to and securely braced against building? (13)		
Are intervals of securing not more than 30 feet horizontally nor more than 26 feet vertically? (13)		
Are guardrails of the strength of a 2 x 4 at a height of 36 to 42 inches with a 4-inch toeboard, installed on all open sides of scaffold? (14)		
Are toeboards at least 4 inches high? (14)		
Is wire mesh of No. 18 gauge with one-half-inch openings provided when employees are passing or working under scaffolds? (14)		
(d) Tubular Welding Frame Scaffolds.		
Are all parts of metal tubular frame scaffolds designed and proved to safely support four times their intended maximum load? (1)		
Is spacing of panels or frames consistent with anticipated loads? (2)		
Are cross bracing or diagonal bracing installed so as to maintain the erected scaffold in a plumb, square, and rigid condition? (3)		
Are scaffold legs set on adjustable or plain bases in such a manner that they provide adequate support for the maximum intended load? (4)		
Are frames placed one on top of the other with coupling or stacking pins aligned? (5)		
Are pins provided and used to lock panels together to prevent dislodgment where uplifting might occur? (6)		

*See Self-Inspection Appendix

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Are guardrails installed that have the strength of a 2 × 4 at a height of 36 to 42 inches? **(7)**		
Are toeboards at least 4 inches high installed? **(7)**		
Is wire mesh of at least No. 18 gauge with one-half-inch openings installed where employees walk or work under the scaffold? **(7)**		
Are scaffolds erected and constructed to support 4 times the maximum intended load? **(8)**		
Are scaffolds secured to the building or structure at intervals not exceeding 30 feet horizontally or 26 feet vertically? **(9)**		
Is scaffolding in excess of 125 feet high designed by a registered professional engineer? **(11)**		
Are drawings available for inspection? **(11)**		
Are scaffolds erected by competent and experienced personnel? **(12)**		
Are scaffolds inspected regularly so that any broken, bent, excessivley rusted, altered, or other structural defects can be corrected prior to continued use? **(13)**		
Does inspection include welded areas and for other possible maintenance purposes? **(13)**		
(e) Outrigger Scaffolds.		
Are outrigger beam extensions beyond the face of a building restricted to less than 6 feet? **(1)**		
Is there at least one and one-half times the length of the outboard beam on the inboard length? **(1)**		
Do all outrigger beams rest on edge? **(1)**		
Are the sides plumb? **(1)**		
Are the edges horizontal? **(1)**		
Is there at least 6 inches of bearing surface at the fulcrum? **(1)**		
Is the beam secured to prevent movement and tipping? **(1)**		
Are inboard ends of beams secured by struts to the overhead beams, or by tension members to floor joists below or by both, if necessary? **(2)**		
Are the inboard ends of beams secured to prevent tipping? **(2)**		
Is the entire supporting structure braced in both directions to prevent horizontal movement? **(2)**		
Are those outrigger scaffolds that are not designed by a professional engineer erected in accordance with Table D-16? (See Appendix.) **(3)**		
Are outrigger scaffolds designed by a licensed professional engineer constructed and erected in accordance with Table D-16? (See Appendix.) **(3)**		
Are drawings available for inspection? **(3)**		
Is planking laid tight and extended to within 3 inches of the building? **(4)**		
Are guardrails installed on all open sides? **(5)**		
Is there wire mesh or other enclosure where there is danger of falling material from the scaffold? **(5)**		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Did a registered professional engineer design scaffolds that have more than two levels? **(6)**		
Are plans available for inspection? **(6)**		
(f) Mason's Adjustable Multiple-Point Suspension Scaffolds.		
Is the scaffold capable of sustaining a working load of 50 pounds per square foot? **(1)**		
Do hoisting machines meet the requirements of a nationally recognized testing laboratory? (See 1910.7 for a definition) **(2)**		
Does the wire rope used for suspension of scaffold have a safety factor of at least six? **(3)**		
Is the scaffold suspended from outrigger beams? **(3)**		
Are the outrigger beams of structural steel and securely anchored? **(4)**		
Does each outrigger beam consist of at least a 7-inch, 15.3 lb. steel I-beam or its equivalent? **(5)**		
Is each beam at least 15 feet long? **(5)**		
The beam does not project more than 6 feet 6 inches beyond the bearing point. **(5)**		
Are outrigger beams set and maintained with the web vertical? **(8)**		
Is there a stop bolt placed at each end of each beam? **(9)**		
Does each beam rest on suitable wood blocking? **(10)**		
Are all parts of the scaffold including bolts, nuts, clamps, wire rope and outrigger beams and their fastenings inspected before each installation? **(11)**		
Is the free end of wire rope equipped with a proper size thimble and the eye spliced around it? **(12)**		
Are the drum ends of the wire securely attached to the drum? **(12)**		
Are there at least four turns of wire rope on the drum at all times? **(12)**		
Is scaffold planking equal to the strength of 2-inch planking? **(14)**		
Are guardrails equivalent to the strength of a 2 × 4? **(15)**		
Are they between 36 and 42 inches high? **(15)**		
Is the toeboard at least 4 inches high? **(15)**		
Is wire mesh No. 18 gauge with one-half-inch openings provided when employees work or walk under the scaffold? **(15)**		
Is the overhead protected by at least 2 inch planking if there is a hazard to workers? **(16)**		
If so, is it 9 feet or less above the scaffold platform? **(16)**		
Is each scaffold installed or relocated within the design limitations imposed by a registered profesional engineer? **(17)**		
Is each scaffold installed or relocated under the supervision of a competent person? **(17)**		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
(g) Two-Point Suspension Scaffolds (Swinging Scaffolds)		
Are scaffold platforms between 20 and 36 inches wide? (1)		
Is the platform securely fastened to the hangers by U-bolts? (1)		
Are scaffold hangers made of wrought iron, mild steel or other material having cross-sectional area capable of holding four times the maximum intended load? (2)		
Do scaffold hangers have a support for guardrails (toprail, midrail and toeboard)? (2)		
Are hoisting machines approved by a nationally recognized testing laboratory? (See 1910.7.) (3)		
Are roof iron (hooks) made of wrought iron, mild steel, or other material of proper size and thickness? (4)		
Are they securely attached? (4)		
Are they anchored? (4)		
Are tiebacks of ¾ inch manila rope? (4)		
Are tiebacks used wherever possible? (4)		
When used, are they secured to a structurally sound portion of the building? (4)		
Are guardrails and toeboards installed on scaffolds that are more than 10 feet above the surface below? (5)		
Are guardrails equivalent to the strength of a 2 x 4? (5)		
Are guardrails between 36 and 42 inches high? (5)		
Are midrails of at least 1 × 4 wood provided? (5)		
Are toeboards at least 4 inches high? (5)		
Is wire mesh of No. 18 gauge with one-half-inch openings provided between toeboard and top rail when other employees work or walk under the scaffolding? (5)		
Is wire or manila rope the means of suspension? (6)		
Does the rope have a safety factor of at least six? (6)		
Is there an inspection conducted prior to each installation on: Wire rope? Fiber rope? Slings? Hangers? Platforms? Other parts? (8)		
Are periodic inspections conducted while scaffold is in use? (8)		
Are no more than 2 persons permitted on scaffolds designed for a working load of 500 pounds? (9)		
Are no more than 3 persons permitted on scaffolds designed for a working load of 750 pounds? (9)		
Is each person working from a scaffold protected by a safety belt and lifeline? (9)		
Is the lifeline securely attached to a structure (other than the scaffold) or to separately rigged lines? (9)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Is the use of fiber rope prohibited where acid solutions are used? (10)		
Are scaffolds securely lashed to the building or structure to prevent swaying? (11)		
Are window cleaners' anchors prohibited for this lashing? (11)		
Are ladder-type platforms built according to accepted practices and standards? (12)(i)		
Are plank-type platforms built in accordance with accepted practices and standards? (12)(ii)		
Are beam platforms built to accepted practices and standards? (12)(iii)		
(h) Stone Setters' Adjustable Multiple Point Suspension Scaffolds.		
Is the scaffold capable of sustaining a working load of 25 pounds per square foot? (1)		
Is the overloading of scaffolds prohibited? (1)		
Is the storage of stone or other heavy materials on scaffolds prohibited? (1)		
Are hoisting machines approved by a nationally recognized testing laboratory? (2)		
Is the platform secured to the hangers by U-bolts? (3)		
Is the scaffold unit suspended from metal outriggers, iron brackets, wire rope slings, or iron hooks? Any one of the above is permissible. (4)		
When outrigger supports are used, are the webs in a vertical position? (5)		
Are they securely anchored? (5)		
Are they provided with stop bolts at each end? (5)		
Is the scaffold supported by a wire rope using a safety factor of at least six? (6)		
Are the free ends of the suspension wires equipped with the proper size thimbles? (7)		
Ae thimbles secured by splicing an eye around them? (7)		
Are the running ends of the suspension wires securely attached to the hoisting drum? (7)		
Is at least four turns of wire required to be on the drum at all times? (7)		
Are guardrails equivalent in strength to a 2 × 4? (8)		
Are they between 36 and 42 inches high? (8)		
Is there a midrail of at least 1- × 4-inch lumber? (8)		
Are toeboards at least 4 inches high? (8)		
Are toeboards installed on all scaffolds more than 10 feet above the ground or surface level? (8)		
Is there a screen between the toeboard and the guardrail where persons can walk under scaffolding? (8)		
Is the screen of No. 18 gauge U.S. wire with one-half-inch mesh? (8)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
When two or more scaffolds are used on a building, is the bridging of them prohibited? (9)		
Are scaffolds installed or relocated in accordance with the designs and instructions of a registered professional engineer? (10)		
Are such installations or relocations supervised by a competent designated person? (10)		

(i) Single-Point Adjustable Suspension Scaffolds.

	YES	NO
Is the entire scaffolding unit of a type tested tand listed by a nationally recognized testing laboratory? (1)		
Are all power-operated gears and brakes enclosed? (3)		
Are the units equipped with an emergency brake which engages automatically? (4)		
Is the cage or basket completely enclosed with guardrails, midrails, and toeboards? (5)		
Are the guardrails equivalent to 2 × 4 lumber? (5)		
Is the toprail between 36 and 42 inches above the platform surface? (5)		
Is the midrail equivalent to a 1 × 6? (5)		
Are the toeboards at least four inches above the platform surface? (5)		
Are the hoisting machines, cables, and equipment regularly serviced? (6)		
Are they inspected after each installation and every 30 days thereafter? (6)		
When two units are combined to form a two-point suspension scaffold, does the installation comply with Sec. 1910.28(g)? (7)		
Is the supporting cable required to be maintained in an absolutely vertical position from the top support to the basket at all times? (8)		
Are the suspension methods in accordance with the same suspension method that is required in Sec. 1910.28(f) and (g)? (10)		

(j) Boatswain's Chairs.

	YES	NO
Is the chair at least 12 by 24 inches and does it have a thickness of one inch? (1)		
Is the seat reinforced on the underside? (1)		
Are the two fiber ropes seat slings at least five-eighths inch diameter? (2)		
When a person is using a boatswain's chair, and is doing a heat producing process, are the seat slings made up of at least three-eighths inch wire rope? (3)		
Is the employee protected by a safety belt attached to a lifeline? (4)		
Is the lifeline securely attached to substantial members of the structure, or to securely rigged lines which will safely suspend the worker in case of a fall? (4)		
Is the manila rope at least five-eighths inch diameter first-grade manila? (5)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Are the roof irons or hooks securely anchored and properly installed? (6)		

(k) Carpenters' Bracket Scaffolds.

	YES	NO
Are the brackets made up of at least 2- by 3-inch wood, or metal of equivalent strength? (1)		
Are the members joined properly and fitted securely? (1)		
Is each bracket secured to the structure by at least a five-eighths-inch bolt that extends through the building wall to the inside, or a metal stud attachment device, or welded to steel tanks, or hooked over a well-secured and adequate strong supporting member? (2)		
Are brackets spaced no more than 10 feet apart? (3)		
Are no more than two persons allowed to occupy any given 10 ft. of scaffolding at any one time? (3)		
Are tools and materials used on the scaffold limited to 75 pounds in addition to the occupants of the scaffold? (3)		
Does the platform planking consist of at least 2- by 9- inch planks? (4)		
Do the planks extend at least 6 inches beyond, but not more than 18 inches beyond each end support? (4)		
Are guardrails equivalent to the strength of a 2 by 4? (5)		
Are the guardrails between 36 and 42 inches high? (5)		
Is the midrail the equivalent of 1- × 4-inch lumber? (5)		
Are the toeboards at least 4 inches high? (5)		
Are guardrails installed on all open sides of the scaffold? (5)		
Is wire mesh of No. 18 wire half-inch openings installed where employees are required to walk or work beneath the scaffold? (5)		

(l) Bricklayers' Square Scaffolds.

	YES	NO
Are the squares not more than 5 feet high or 5 feet wide? (1)		
Are scaffold members made up into the dimensions of Table D-18*? (2)		
Are both sides of each corner of the square equipped with 1- by 6-inch gussets? (3)		
Are the squares reinforced properly so that they will maintain their rigidity? (3)		
On medium-duty scaffolds, are the squares set not more than 5 feet apart? (4)		
On light-duty scaffolds, are the squares set not more than 8 feet apart? (4)		
Is bracing of at least 1- by 8- inch lumber installed from the bottom of one square to the top of the next square at both front and rear sides of the scaffold? (4)		
Is platform planking at least 2- by 9-inch nominal size? (5)		
Do the ends of the planks overlap the bearers of the squares? (5)		
Is each plank supported by not less than three squares? (5)		
In tiering bricklayers' square scaffolds, is the height limited to two tiers, and are they arranged so that one square rests directly above the other square? (6)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Do the upper tiers stand on a continuous row of planks laid across the next lower tier? (6)		
Are tiers secured to prevent displacement? (6)		
Are the scaffolds maintained in a level position, and are they set upon a firm foundation? (7)		
(m) Horse Scaffolds.		
Are horse scaffolds limited to 10 ft. in height? (1)		
Do the members of the horse scaffolds meet the minimum dimensions as set forth in Table D-19*? (2)		
For medium-duty scaffolds are the horses placed no more than 5 feet apart? (3)		
For light-duty scaffolds, are they placed no more than 8 feet apart? (3)		
When using horse scaffolds in a tiered arrangement, is each horse placed directly over the horse in the tier below? (4)		
Are the legs of the horse securely nailed to the planks, and is each tier substantially cross-braced? (5)		
Are defective horses or parts thereof removed from service? (6)		
On scaffolds more than 10 feet above the ground or floor, are guardrails made up of the equivalent of 2- by 4-inch lumber? (7)		
Is the toprail at least 36 inches but not more than 42 inches above the platform surface? (7)		
Is the midrail of 1- by 4-inch lumber, or its equivalent used? (7)		
Are toeboards installed and are they 4 inches or more in height? (7)		
Are guardrails and toeboards installed on all open sides of the scaffold? (7)		
Is wire mesh of No. 18 wire with half-inch openings installed where people or employees are required to walk or work below? (7)		
(n) Needle Beam Scaffold.		
Are the wood needle beams at least 4 by 6 inches, and is the greater dimension placed in the vertical direction? (1)		
Are ropes or hangers provided for supports? (2)		
Are these supports not more than 10 feet on 4- by 6-inch timbers? (2)		
Are the rope supports equivalent in strength to at least 1-inch diameter manila rope? (2)		
Are the ropes attached to the needle beam by a scaffold hitch, or a properly made eye splice? (3)		
Is the loose end of the rope secured by tieing a bowline knot or a round turn and a half-hitch? (3)		
When using 2-inch scaffold plank, is the span less than 8 feet? (4)		
If a span of more than 8 feet is required, are the platforms designed, based on design requirements for the special span? (4)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS

	YES	NO
Is the overhang of each end of each platform plank not less than 1 foot or more than 18 inches? (4)		
When the platform planking is not level, are the planks secured to the needle beams to prevent slipping? (5)		
Are all loose materials and tools kept in suitable containers on the scaffold? (6)		
Is each person working on a scaffold more than 20 feet above the ground or floor equipped with a safety belt attached securely to the lifeline? (8)		
Are lifelines securely attached to substantial members of the structure, or to securely rigged lines which will safely suspend the worker in case of a fall? (8)		
(o) Plasterers', Decorators', and Large Area Scaffolds.		
Are these scaffolds constructed in accordance with the general requirements for independent wood pole scaffolds, Sec. 1910.28(b)? (1)		
On scaffolds 10 feet or more above the ground or floor level, are guardrails at least 36 inches high, but not more than 42 inches high, installed? (2)		
Are these guardrails equivalent to the strength of a 2 by 4? (2)		
Is a 1 by 4 midrail installed? (2)		
Are toeboards at least 4 inches in height installed? (2)		
Are the railings and toeboards installed on all open sides of the platform? (2)		
Is wire mesh of No. 18 wire with half-inch openings installed where employees are required to walk and work below? (2)		
Are all platform planks installed with the edges close together? (3)		
(p) Interior Hung Scaffolds.		
Does the wire rope used for suspending these scaffolds have a safety factor of six? (2)		
On interior hung wood scaffolds are the supporting bearers 2 by 9 inches and are they on edge? (3)		
Are the planks in use at least 2 by 9 inches in dimension? (3)		
On heavy-duty scaffolds, is the maximum span allowed 7 feet? (3)		
On light- or medium-duty scaffolds, is the maximum planking span not more than 10 feet? (3)		
When steel tube and coupler members are used on interior hung scaffolds, is the scaffold designed as a heavy-duty scaffold with a safety factor of four? (4)		
When the scaffold is supported by means of wire rope, are there at least 2 turns around the support and 2 turns around the bearing members of the scaffolds? (5)		
Are the loose ends of the wire secured by at least three standard wire rope clips? (5)		
Is an inspection made of the overhead supporting members to determine strength prior to the erection of the scaffold? (6)		
When the platform is more than 10 feet above the ground, are guardrails installed? (7)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS	YES	NO
Do the guardrails have a strength that is equal to a 2 by 4? (7)		
Is the toprail between 36 and 42 inches above the platform? (7)		
Is the midrail equivalent to 1- × 4-inch lumber? (7)		
Are toeboards installed where people are required to walk and work beneath the platform? (7)		
Are the toeboards at least 4 inches in height? (7)		
Is wire mesh of No. 18 U.S. wire gauge installed between the toeboard and the upper rail when people are required to walk and work below the platform? (7)		
(q) Ladder-Jack Scaffolds.		
Are ladder-jack scaffolds limited to light duty only? (1)		
When using ladder-jack scaffolds, is the height of the platform restricted to 20 feet above the floor or ground? (1)		
Are ladders of the heavy-duty type? (2)		
Do all ladders conform to standards 1910.25 and 1910.26? (2)		
Are ladder-jacks designed to bear on the side rails and the ladder rungs? (3)		
If the ladder-jacks bear only on the rungs, is the bearing area at least 10 inches on each rung? (3)		
Are all ladders used as ladder-jacks so placed that they will not slip? (4)		
Are wood platform planks no less than 2 inches in thickness? (5)		
Is the planking span no more than 8 feet? (5)		
Is the platform width no less than 18 inches? (5)		
Do platform planks overlap the bearing surface no less than 12 inches? (5)		
Are no more than two employees allowed to occupy any given 8 feet of any scaffold at one time? (6)		
(r) Window-Jack Scaffolds.		
Are window-jack scaffolds only used for the purpose of working at the window opening? (1)		
Is the placing of planks between window-jacks between window openings prohibited? (2)		
Are window-jacks provided with guardrails? If not, are safety belts and lifelines required for each worker? (3)		
Is only one person allowed to use the window-jack scaffold at one time? (3)		
(s) Roofing Brackets.		
Are roofing brackets constructed to fit the pitch of the roof? (1)		
Are all roofing brackets attached by nailing? (2)		
Are the nails driven full length into the roof? (2)		
When rope supports are used, are they at least three quarter inch first-grade manila or the equivalent? (2)		

1910.28 — SCAFFOLDING SAFETY REQUIREMENTS	YES	NO
When the distance between the eaves and the ground is more than 20 feet, are the employees on roofing brackets required to wear safety belts and lifelines? If not, is there a substantial catch platform installed below the working area of the eaves? (3)		
Does the platform have a width extending 2 feet beyond the projection of the eaves? (3)		
Does this platform have safety rails, midrail and toeboards? (3)		
(t) Crawling Boards or Chicken Ladders.		
Are crawling boards at least 10 inches wide and 1 inch thick? (1)		
Are cleats of at least 1 x 1½ inches provided? (1)		
Do the cleats extend the full width of the board? (1)		
Is the spacing of the cleats not more than 24 inches? (1)		
Are the cleats secured by nails driven clear through the board and clinched on the underside? (1)		
Does the crawling board extend the full length from the ridge pole to the eaves? (1)		
Is each crawling board equipped with a three-quarter inch rope strung alongside for a handhold? (2)		
Are crawling boards secured to the roof by means of adequate ridge hooks or equally effective means? (3)		
(u) Float or Ship Scaffolds.		
Are not more than three persons allowed on the ship scaffold at any one time? (1)		
Is the scaffold at least 3 feet wide and 6 feet long? (2)		
Is the platform of at least three-quarter-inch plywood? (2)		
Are supporting bearers placed under the platform? (3)		
Are the supporting bearers made up of 2- x 4-inch or 1- x 10-inch lumber or better? (3)		
Are the supporting bearers free of knots or other flaws, and do they project 6 inches beyond the platform on both sides? (3)		
Are the bearers securely fastened to the platform? (3)		
Is there an edging around the platform to prevent tools from rolling off? (4)		
Are the supporting ropes at least equivalent to 1-inch diameter manila? (5)		
Are the rope connections such that the platform cannot shift or slip? (5)		
Are these ropes securely fastened to the bearers? (5)		
Is each workman using a ships' scaffold provided with a safety belt and a lifeline? (6)		
Is the lifeline securely attached to something other than the scaffold? (6)		

1910.29 — MANUALLY PROPELLED MOBILE LADDER STANDS AND SCAFFOLDS (TOWERS)

	YES	NO
(a) General Requirements.		
Are light-duty scaffolds designed and constructed to carry a working load of 25 pounds per square foot? (ii)(b)		
Are medium-duty scaffolds designed and constructed to carry a working load of 50 pounds per square foot? (ii)(b)		
Are heavy-duty scaffolds designed and constructed to carry a working load of 75 pounds per square foot? (ii)(b)		
Are all ladder stands and scaffolds capable of supporting at least 4 times the designed working load? (ii)(b)		
Are all exposed surfaces free from sharp edges, burrs, or other safety hazards? (2)(v)		
Is the maximum work-level height not more than 4 times the minimum base dimension? (3)(i)		
If the maximum work-level height is more than 4 times the minimum base dimension, are suitable outrigger frames installed? (3)(i)		
If suitable outrigger frames are not installed, are there provisions made to guy or brace the unit against tipping? (3)(i)		
Are the work levels at least 20 inches wide? (3)(ii)		
On ladder stands is the minimum step width at least 16 inches? (3)(ii)		
Is the supporting structure for the work level rigidly braced? (3)(iii)		
Are the steps of ladder stands equipped with slip-resistent treads? (3)(iv)		
On work levels that exceed 10 feet from the ground or floor, are standard guardrails provided? (3)(vi)		
Does the toprail have a strength equal to a 2 x 4? (3)(vii)		
Is the height of the guardrail between 36 and 42 inches? (3)(vii)		
Are there midrails and toeboards provided? (3)(vii)		
Are the ladders or stairways provided for proper access to the levels of the scaffolding? (3)(viii)		
Are these ladders fixed so that they will not have a tendency to tip the scaffolds? (3)(viii)		
Do wheels or casters have a safety factor of at least four? (4)(i)		
Are scaffold casters provided with a positive wheel and/or swivel lock? (4)(ii)		
Are ladder stands equipped with at least two casters and are they of the swivel type? (4)(ii)		
When leveling the elevated work platform, are screw jacks or other suitable means provided for adjusting the height? (4)(iii)		
Are screw jacks in the base section of each mobile unit? (4)(iii)		
(b) Mobile Tubular Welded Frame Scaffolds.		
Are the units designed to comply with the preceding questions? (1)		

1910.29 — MANUALLY PROPELLED MOBILE LADDER STANDS AND SCAFFOLDS (TOWERS)

	YES	NO
Are scaffolds provided with a sufficient number of crossbraces and diagonal braces? (2)		
Do these cross braces automatically square and align vertical members? (2)		
Is the erected scaffold always plumb and rigid? (2)		
Is the spacing of panels or frames consistent with the loads imposed? (3)		
Are frames placed one on top of the other with coupling or stacking pins to provide proper vertical alignment of the legs? (3)		
Are panels locked together vertically by pins or other equivalent means? (4)		
On scaffolds exceeding 50 feet in height does the manufacturer's agent supervise the erection of these scaffolds? (5)		
(c) Mobile Tubular Welded Sectional Folding Scaffolds.		
Are the design requirements as listed in the questions in Section (a) complied with? (1)		
Is an integral stairway and work platform incorporated into the structure of each sectional folding stairway scaffold? (2)		
Are folding diagonal and horizontal braces incorporated into the structure of each sectional folding ladder scaffold? (3)		
Is each section designed to accept a detachable work platform? (3)		
Are sectional folding stairway scaffolds designed as *medium-duty* scaffolds? (4)		
Is the width of a sectional folding stairway scaffold not more than 4½ feet? (4)		
Is the length of the sectional folding stairway scaffold not more than 6 feet? (4)		
Are sectional folding ladder scaffolds designed as *light-duty* scaffolds? (5)		
Is the width of a sectional folding ladder scaffold not more than 4½ feet? (5)		
[Published in Federal Register 6/27/74, amended 8/10/84]		
Is the length of a sectional folding ladder scaffold not more than 6 feet 6 inches for a six-foot long unit? (5)		
Is the length of a sectional folding ladder scaffold not more than 8'6" for an 8-foot unit? (5)		
Is the length of a sectional folding ladder scaffold not more than 10'6" for a 10-foot unit? (5)		
Are end frames of sectional ladder and stairway scaffolds designed so that the horizontal bearers provide supports for multiple planking levels? (6)		
On scaffolds exceeding 50 feet in height does the manufacturer's designated agent supervise the erection of the scaffold? (7)		

1910.29 — MANUALLY PROPELLED MOBILE LADDER STANDS AND SCAFFOLDS (TOWERS)

YES NO

d) Mobile Tube and Coupler Scaffolds.

Are the units designed to comply with the questions in (a) above? (1)

Is the material used for couples of something other than gray cast iron? (2)

On scaffolds more than 50 feet high, does the manufacturer provide a qualified agent to supervise the erection? (3)

(e) Mobile Work Platforms.

Are the units designed for the intended? (1)

Is the width of the base of the mobile work platform not less than 20 inches? (2)

Are vertical members equipped with adequate rigid diagonal bracing? (3)

(f) Mobile Ladder Stands.

Are the units designed for the use for which they are intended? (1)

Is the maximum work level height not more than 4 times the minimum base width? (2)

Is the maximum length of the base section at least the horizontal measurement of the steps and the top assembly plus five-eighths-inch per step of rise? (2)

Are the steps uniformly spaced? (3)

Are the steps uniformly sloped? (3)

Is the rise of the steps between 9 and 10 inches? (3)

Is the depth of each step at least 7 inches? (3)

Is the angle of slope of the steps between 55° and 60° measured from the horizontal? (3)

Are units having more than five steps, or more than 60 inches in vertical height equipped with handrails? (4)

Is the minimum height of these handrails 29 inches, measured vertically from the center of the step to the handrail? (4)

Does the working level of the platform have a safety factor of at least four? (5)

1910.30 — OTHER WORKING SURFACES

(a) Dockboards.

Are portable and powered dockboards designed to carry the load imposed? (1)

Are portable dockboards secured in position to prevent their movement? (2)

Do manufacturers certify that their powered dockboards comply with U.S. Department of Commerce Commercial Standard CS 202-56 (1961)? (3)

Are portable dockboads equipped with handholds or other effective means to permit safe handling? (4)

1910.30 — OTHER WORKING SURFACES

YES NO

When dockboards or bridge plates are in use in railroad cars, are means provided so that the railroad cars cannot be moved? (5)

(b) Forging Machine Area.

Are machines installed so that the operators of each machine will not interfere with the operators of another machine? (1)

Is there ample room for the cleaning of the machines and handling of the work, including metal and scrap? (1)

Is the arrangement of the machines such that the operators will not be required to stand in the aisles? (1)

Are aisles sufficiently wide to provide for the free movement of employees handling material? (2)

Is the aisle only intended to be an aisle and not a place of work? (2)

Is storage space properly defined by marking? (2)

If wood platforms are used in front of the machines, are they substantially constructed? (3)

(c) Veneer Machinery.

Do the sides of steam vats extend at least 36 inches above the floor, working platforms or ground? (1)

If large steam vats are divided into sections, are there substantial walkways provided between sections? (2)

Are these walkings provided with standard handrails on each exposed side? (2)

Are the covers of steam vats removed only on the portion that persons are working? (3)

Is there a portable railing provided at these places where the covers are removed? (3)

Are workers prohibited from riding or stepping on logs in the steam vats? (4)

[Published in Federal Register 6/27/74, amended 8/10/84]

TABLE D-1

Angle to horizontal	Rise (in inches)	Tread run (in inches)
30°35′	6½	11
32°08′	6¾	10¾
33°41′	7	10½
35°16′	7¼	10¼
36°52′	7½	10
38°29′	7¾	9¾
40°08′	8	9½
41°44′	8¼	9¼
43°22′	8½	9
45°00′	8¾	8¾
46°38′	9	8½
48°16′	9¼	8¼
49°54′	9½	8

Some rise/tread dimensions for stairs

TABLE D-7 – Minimum Nominal Size and Maximum Spacing of Members of Single Pole Scaffolds, Light Duty

	Maximum height of scaffold	
	20 feet	60 feet
Uniformly distributed load	Not to exceed 25 pounds per square foot.	
Poles or uprights	2 by 4 in.	4 by 4 in.
Pole spacing (longitudinal)	6 ft. 0 in.	10 ft. 0 in.
Maximum width of scaffold	5 ft. 0 in.	5 ft. 0 in.
Bearers or putlogs to 3 ft. 0 in. width	2 by 4 in.	2 by 4 in.
Bearers or putlogs to 5 ft. 0 in. width	2 by 6 in. or 3 by 4 in.	2 by 6 in. or 3 by 4 in. (rough).
Ledgers	1 by 4 in.	1¼ by 9 in.
Planking	1¼ by 9 in. (rough)	2 by 9 in.
Vertical spacing of horizontal members	7 ft. 0 in.	7 ft. 0 in.
Bracing, horizontal and diagonal	1 by 4 in.	1 by 4 in.
Tie-ins	1 by 4 in.	1 by 4 in.
Toeboards	4 in. high (minimum)	4 in. high (minimum).
Guardrail	2 by 4 in.	2 by 4 in.

TABLE D-8 – Minimum Nominal Size and Maximum Spacing of Members of Single Pole Scaffolds, Medium Duty

Uniformly distributed load.	Not to exceed 50 pounds per square foot.
Maximum height of scaffold.	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal).	8 ft. 0 in.
Maximum width of scaffold.	5 ft. 0 in.
Bearers or putlogs	2 by 9 in. or 3 by 4 in.
Spacing of bearers or putlogs.	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members.	9 ft. 0 in.
Bracing, horizontal	1 by 6 in. or 1¼ by 4 in.
Bracing, diagonal	1 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

TABLE D-9 – Minimum Nominal Size and Maximum Spacing of Members of Single Pole Scaffolds, Heavy Duty

Uniformly distributed load.	Not to exceed 75 pounds per square foot.
Maximum height of scaffold.	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal).	6 ft. 0 in.
Maximum width of scaffold.	5 ft. 0 in.
Bearers or putlogs	2 by 9 in. or 3 by 5 in. (rough).
Spacing of bearers or putlogs.	6 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members.	6 ft. 6 in.
Bracing, horizontal and diagonal.	2 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

TABLE D-10 – Minimum Nominal Size and Maximum Spacing of Members of Independent Pole Scaffolds, Light Duty

	Maximum height of scaffold	
	20 feet	60 feet
Uniformly distributed load	Not to exceed 25 pounds per square foot.	
Poles or uprights	2 by 4 in	4 by 4 in.
Pole spacing (longitudinal)	6 ft. 0 in	10 ft. 0 in.
Pole spacing (transverse)	6 ft. 0 in	10 ft. 0 in.
Ledgers	1¼ by 4 in	1¼ by 9 in.
Bearers to 3 ft. 0 in. span	2 by 4 in	2 by 4 in.
Bearers to 10 ft. 0 in. span	2 by 6 in. or 3 by 4 in	2 by 9 (rough) or 3 by 8 in.
Planking	1¼ by 9 in	2 by 9 in.
Vertical spacing of horizontal members	7 ft. 0 in	7 ft. 0 in.
Bracing, horizontal and diagonal	1 by 4 in	1 by 4 in.
Tie-ins	1 by 4 in	1 by 4 in.
Toeboards	4 in. high	4 in. high (minimum).
Guardrail	2 by 4 in	2 by 4 in.

TABLE D-11 – Minimum Nominal Size and Maximum Spacing of Members of Independent Pole Scaffolds, Medium

Uniformly distributed load.	Not to exceed 50 pounds per square foot.
Maximum height of scaffold.	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal).	8 ft. 0 in.
Pole spacing (transverse).	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members.	6 ft. 0 in.
Spacing of bearers	8 ft. 0 in.
Bearers	2 by 9 in. (rough) or 2 by 10 in.
Bracing, horizontal	1 by 6 in. or 1¼ by 4 in.
Bracing, diagonal	1 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

TABLE D-12 – Minimum Nominal Size and Maximum Spacing of Members of Independent Pole Scaffolds, Heavy Duty

Uniformly distributed load.	Not to exceed 75 pounds per square foot.
Maximum height of scaffold.	60 ft.
Poles or uprights	4 by 4 in.
Pole spacing (longitudinal).	6 ft. 0 in.
Pole spacing (transverse).	8 ft. 0 in.
Ledgers	2 by 9 in.
Vertical spacing of horizontal members.	4 ft. 6 in.
Bearers	2 by 9 in. (rough).
Bracing, horizontal and diagonal.	2 by 4 in.
Tie-ins	1 by 4 in.
Planking	2 by 9 in.
Toeboards	4 in. high (minimum).
Guardrail	2 by 4 in.

TABLE D-13 – Tube and Coupler Scaffolds, Light Duty

Uniformly distributed load	Not to exceed 25 p.s.f.
Post spacing (longitudinal)	10 ft. 0 in.
Post spacing (transverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	8	125 ft.
2	4	125 ft.
3	0	91 ft. 0 in.

TABLE D-14 – Tube and Coupler Scaffolds, Medium Duty

Uniformly distributed load	Not to exceed 50 p.s.f.
Post spacing (longitudinal)	8 ft. 0 in.
Post spacing (transverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	6	125 ft.
2	0	78 ft. 0 in.

S12

TABLE D-15 – Tube and Coupler Scaffolds, Heavy Duty

Uniformly distributed load	Not to exceed 75 p.s.f.
Post spacing (longitudinal)	6 ft. 6 in.
Post spacing (traverse)	6 ft. 0 in.

Working levels	Additional planked levels	Maximum height
1	6	125 ft.

TABLE D-18 – Minimum Dimensions for Bricklayers' Square Scaffold Members

Members:	*Dimensions (inches)*
Bearers or horizontal members	2 by 6.
Legs	2 by 6.
Braces at corners	1 by 6.
Braces diagonally from center frame	1 by 8.

TABLE D-16 – Minimum Nominal Size and Maximum Spacing of Members of Outrigger Scaffolds

	Light duty	Medium duty
Maximum scaffold load	25 p.s.f.	50 p.s.f.
Outrigger size	2 x 10 in.	3 x 10 in.
Maximum outrigger spacing.	10 ft 0 in.	6 ft 0 in.
Planking	2 x 9 in.	2 x 9 in.
Guardrail	2 x 4 in.	2 x 4 in.
Guardrail uprights	2 x 4 in.	2 x 4 in.
Toeboards	4 in. (minimum).	4 in. (minimum).

TABLE D-19 – Minimum Dimensions for Horse Scaffold Members

Members:	*Dimensions (inches)*
Horizontal members or bearers	3 by 4.
Legs	1¼ by 4½.
Longitudinal brace between legs	1 by 6.
Gusset brace at top of legs	1 by 8.
Half diagonal braces	1¼ by 4½.

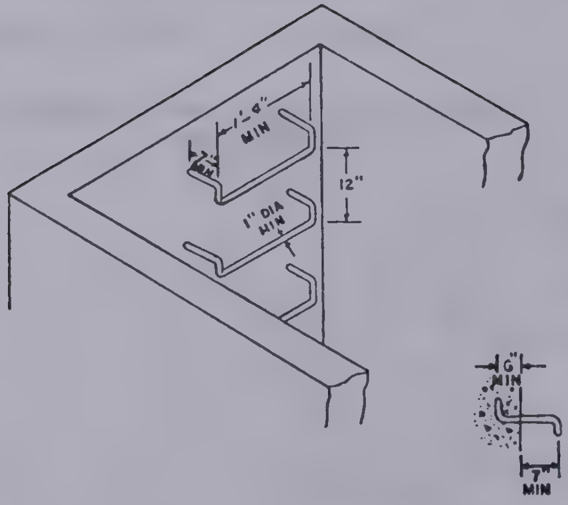
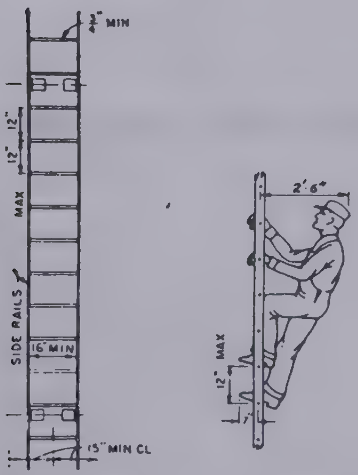


FIGURE D-1 – Suggested Design for Rungs on Individual-Rung Ladders



RAIL LADDER WITH BAR STEEL RAILS AND ROUND STEEL RUNGS

FIGURE D-2 – Minimum Ladder Clearances

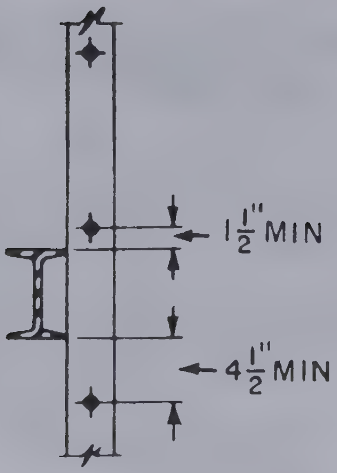


FIGURE D-3 – Clearance for Unavoidable Obstruction at Rear of Fixed Ladder

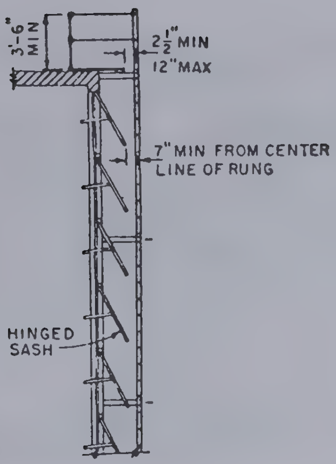


FIGURE D-4

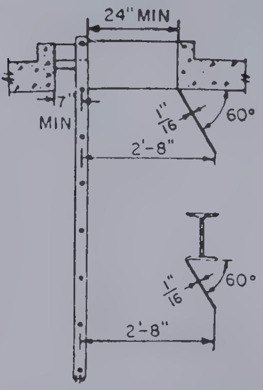


FIGURE D-5 – Deflector Plates for Head Hazards

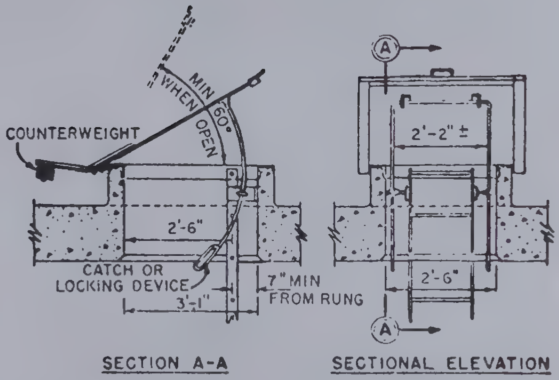


FIGURE D-6 – Relationship of Fixed Ladder to a Safe Access Hatch

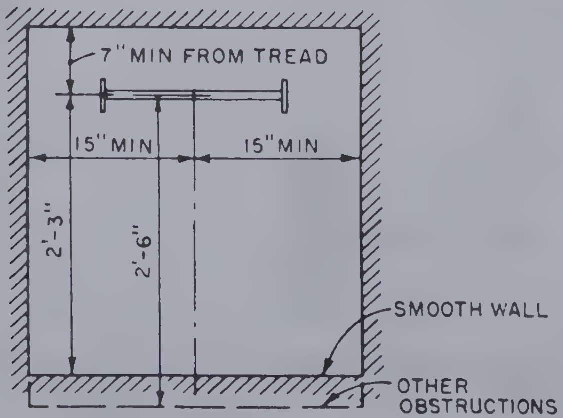


FIGURE D-7 – Clearance Diagram for Fixed Ladder in Well

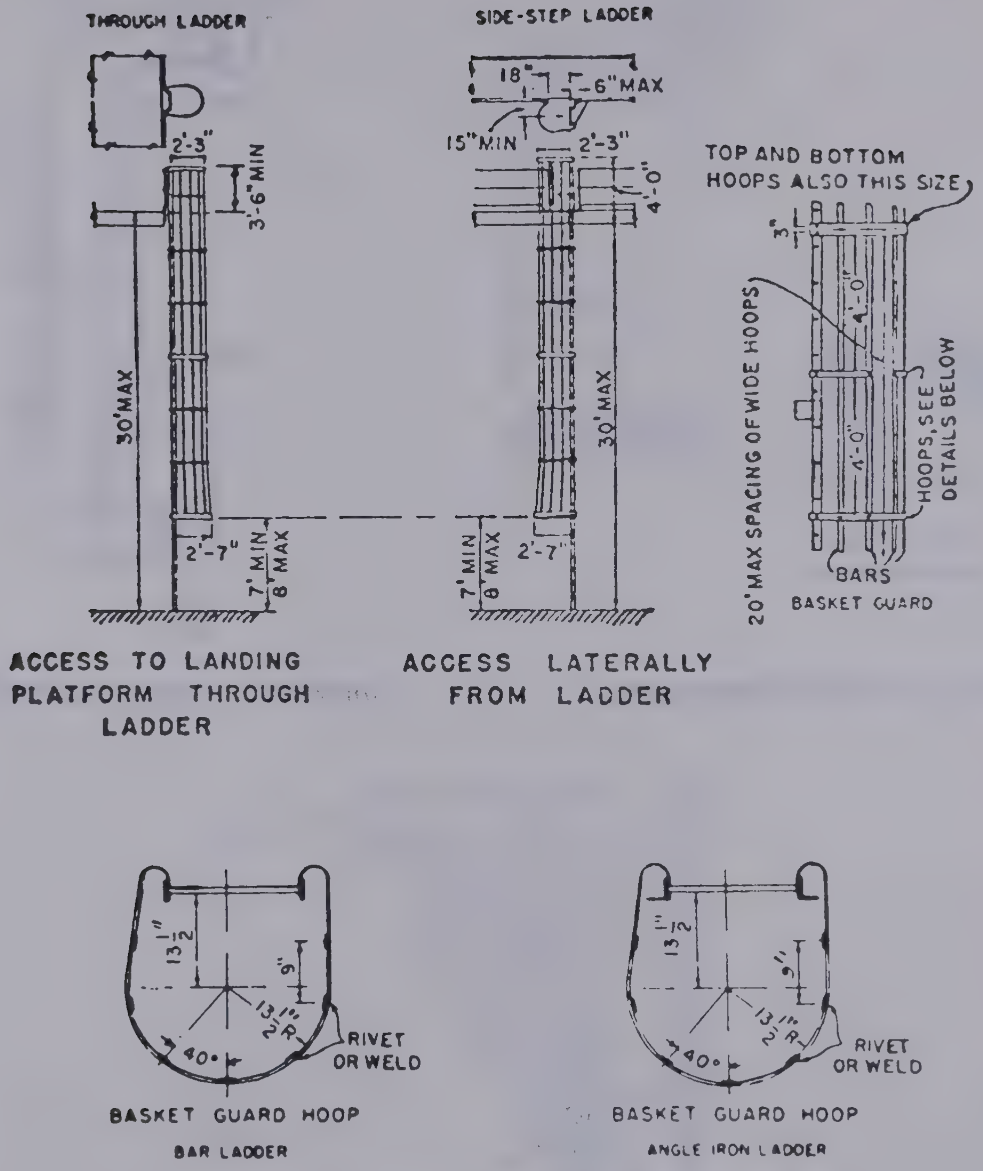
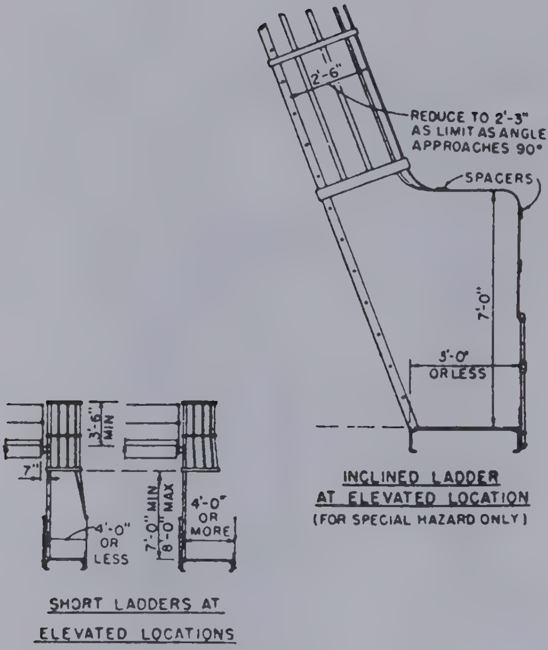


FIGURE D-8 – Cages for Ladders More Than 20 Feet High



SHORT LADDERS AT ELEVATED LOCATIONS

INCLINED LADDER AT ELEVATED LOCATION (FOR SPECIAL HAZARD ONLY)

FIGURE D-9 – Cages – Special Applications

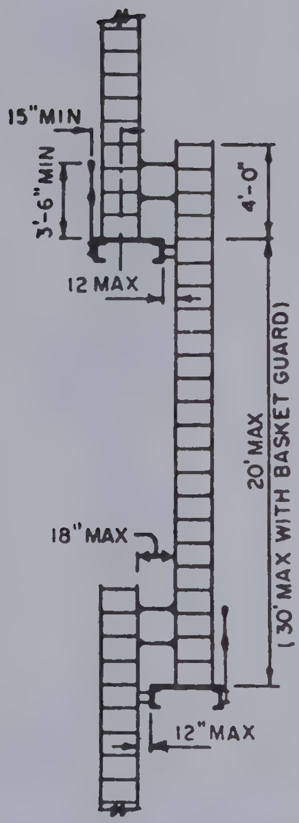


FIGURE D-10 – Offset Fixed Ladder Sections

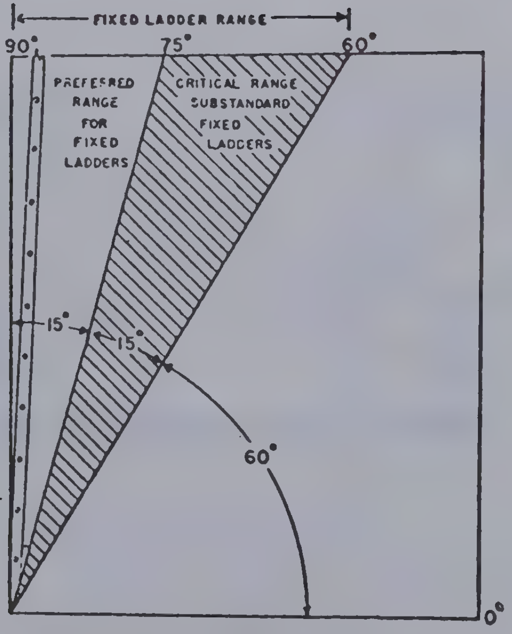

FIXED LADDER RANGE
90°
75°
60°
PREFERRED RANGE FOR FIXED LADDERS
CRITICAL RANGE SUBSTANDARD FIXED LADDERS
15°
15°
60°
0°

FIGURE D-11 Pitch of Fixed Ladders

OVERVIEW: SUBPART E

MEANS OF EGRESS

This standard, applicable to all industries and operations, sets out the requirements for ensuring that there be a safe means of egress in the event of an emergency requiring evacuation of personnel from a facility.

There are requirements that there be a sufficient number of exits to permit an emergency evacuation in case of fire or other emergency. Exits and exit paths are to be clearly visible and appropriately marked.

This standard also outlines requirements for written emergency plans, but this applies only when a particular OSHA standard which requires such a plan applies to your operation or facility. Details of the emergency plan requirement are shown on page E-03. The Appendix on pages E-05 offers additional guidelines.

Some key elements of an emergency action plan include: designation and assignment of emergency duties; an alarm system; an evacuation plan; a plan for emergency response training; and a fire prevention plan.

Firms with 10 or fewer employees need not have a written emergency plan. They can, instead, communicate such a plan orally.

Specific sections of the standards covered in the checklist are:

Std. No.		**Page No.**
1910.36	**General requirements**	(E-01)
1910.37	**Means of egress**	(E-02)
1910.38	**Emergency plans**	(E-03)(E-05)
1910.38	**Fire prevention plan**	(E-03)

DEFINITIONS — SUBPART E

Means of egress. A continuous and unobstructed way of exit travel from any point in a building or structure to a public way. A means of egress comprises the ways of travel and shall include intervening room spaces, doorways, hallways, corridors, passageways, balconies, ramps, stairs, enclosures, lobbies, escalators, horizontal exits, courts, and yards.

Exit access. That portion of a means of egress which leads to the entrance to an exit.

Exit. That portion of a means of egress which is separated from all other spaces of the building or structure by construction or equipment as required to provide a protected way of travel to the exit discharge.

Exit discharge. That portion of a means of egress between the termination of an exit and a public way.

Low hazard contents. Contents classified as those of such low combustibility that no self-propagating fire therein can occur and that consequently the only probable danger requiring the use of emergency exits will be from panic, fumes or smoke, or fire from some external source.

High-hazard contents. Contents classified as those which are liable to burn with extreme rapidity or from which poisonous fumes or explosions are to be feared in the event of fire.

Ordinary hazard contents. Contents classified as those which are liable to burn with moderate rapidity and to give off a considerable volume of smoke but from which neither poisonous fumes nor explosions are to be feared in case of fire.

Approved. Approved shall mean equipment listed or approved by a nationally recognized testing laboratory.

"Emergency action plan." A plan for a workplace describing what procedures the employer and employees must take to ensure employee safety from fire or other emergencies.

"Emergency escape route." The route that employees are directed to follow in the event they are required to evacuate the workplace or seek a designated refuge area.

1910.36 — GENERAL REQUIREMENTS

YES | NO

(b) Fundamental Requirements.

Are there sufficient exits provided to permit the prompt escape of all employees in case of fire or other emergency? (1)

Is the design of exits and other safeguards such that the reliance for safety to life is not dependent solely on any single safeguard? (1)

Are additional safeguards provided where any single safeguard becomes ineffective due to some human or mechanical failure? (1)

Is every place of employment constructed, arranged, equipped, maintained and operated so as to avoid undue danger to the lives and safety of its occupants from fire, smoke, fumes, or panic during the necessary escape time? (2)

Is every building or structure provided with exits of the kinds, numbers, locations and capacity appropriate to the individual building or structure? (3)

Is due regard given to the character of the occupancy, the number of persons exposed, the fire protection available, the height and type of construction of the building or structure, to afford all occupants convenient escape facilities? (3)

Are exits so arranged and maintained so as to provide free and unobstructed egress from all parts of the building while it is occupied? (4)

Is the use of locks or other fastening devices prohibited that would prevent free escape from the inside of any building? (4)

Is every exit clearly visible? (5)

Is every route to the exit conspicuously indicated? (5)

Is every path of escape so arranged and marked that the way to the place of safety is unmistakable? (5)

Are doorways or passageways not intended to be exits so arranged and marked to prevent confusion with an exit? (5)

Are all exit facilities equipped with reliable and adequate illumination to mark such exit facilities? (6)

Are fire alarm facilities provided to warn occupants of the existence of a fire or emergency? (7)

(c) Protection of Employees Exposed by Construction and Repair Operations.

Are all exit facilities ready for use prior to allowing the building or structure to be occupied? (1)

Are existing exits and any existing fire protection equipment provided while the building is undergoing alterations or repair? (2)

Is the storage of flammable or explosive substances required for the repair or alteration of the building prohibited while the building is occupied? (3)

(d) Maintenance.

Is every required exit, way of approach thereto, and way of travel from the exit into the street or open space, maintained free of all obstructions at all times? (1)

Where automatic sprinkler system, fire detection and alarm systems, exit lighting, fire doors and other items of equipment are provided, are they maintained in a proper operating condition at all times? (2)

1910.37 — MEANS OF EGRESS, GENERAL

YES | NO

(b) Protective Enclosure of Exits.

Are exits protected by separation from other parts of the building?

If the building is three stories or less, does the separation have at least a 1-hour fire-resistance rating? (1)

If the building is four or more stories, does the separation have at least a 2-hour fire-resistance rating? (2)

Is the separation material constructed of non-combustible material? (2)

Does the support of the construction material for the separation have at least a 2-hour fire-resistance rating? (2)

Are all openings in the separations protected by an approved self-closing fire door? (3)

Are the openings in the exits enclosures limited to those necessary for access to the enclosure and for egress from the enclosure? (4)

(c) Width and Capacity of Means of Egress.

Is the capacity and number of persons per unit of exit width in accordance with the information in Table E-1? (1)

TABLE E-1 — Designation of Class A and Class B Ramps

	Class A	Class B
Width	44 inches and greater.	30 to 44 inches.
Slope	1 to $1\frac{3}{16}$ inches in 12 inches.	$1\frac{3}{16}$ to 2 inches in 12 inches.
Maximum height between landings. .	No limit.	12 feet.

Are units of exit measured at the narrowest point of the means of egress? (3)

Do handrailings project not more than 5 inches into the units of exit width? (3)

Do exit doors swing into the aisle or passageway so that they do not restrict the effective exit width? (3)

(d) Egress Capacity and Occupant Load.

Is the capacity of means of egress sufficient for the occupant load? (1)

(e) Arrangement of Exits.

When the occupant load is such that there is more than one exit required from a story, are the exits so arranged so that they will be remote from each other?

Are they so arranged so as to minimize any possibility that both may blocked at any one time?

1910.37 – MEANS OF EGRESS, GENERAL
(f) Access to Exits

	YES	NO
(f) Access to Exits.		
Are exits so located and so arranged that they are readily accessible at all times? (1)		
Are exits immediately accessible from all open floor areas? If not, are safe and continuous passageways so arranged so as to provide convenient access for each occupant to at least two exits by separate ways of travel? (1)		

1910.37 – MEANS OF EGRESS, GENERAL
(f) Access to Exits

	YES	NO
Are doors from a room to an exit or to a way of exit of the side-hinged swinging type? (2)		
Do the doors swing with exit travel when the room is occupied by more than 50 persons? (2)		
Are accesses to exits through rooms that cannot be locked? (3)		
Are the ways of exit access and the doors to the exits to which they lead so designed as to be clearly recognizable as exits? (4)		
Are the hangings of draperies across exit doors prohibited? (4)		
Is the placing of mirrors on exit doors prohibited? (4)		
Is every exit access so arranged so that it will not be necessary to travel toward any area of high-hazard occupancy? (5)		
Is the minimum width of any way of exit no less than 28 inches? (6)		
(g) Exterior Ways of Exit Access.		
Do exterior ways of exit access have smooth, solid floors? (2)		
Are they substantially level? (2)		
Are guards installed on all the unenclosed sides? (2)		
Where accumulation of snow or ice is likely because of the climate, are exterior ways of exit access protected by a roof? (3)		
Are permanent exterior ways of exit reasonably straight? (4)		
Are railings, barriers, or gates prohibited in the exterior ways of access? (4)		
Are deadends in exterior ways of exit access limited to no more than 20 feet? (5)		
Are any galleries, balconies, bridges, porches or other exterior exit accesses that project beyond the outside wall of the building sufficiently wide to carry the occupant load? (6)		
(h) Discharge from Exits.		
Do all exits discharge directly to a street or other open space that gives safe access to a public way? (1)		
Are stairs and other exits so arranged that the direction of travel is clear? (2)		

1910.37 – MEANS OF EGRESS, GENERAL

	YES	NO
Are exit stairs that continue beyond the floor of discharge provided with partitions, doors or other effective means? (2)		
(i) Headroom.		
Is the headroom provided in any means of egress no less than 7 feet 6 inches?		
Do any projections from the ceiling project no less than 6 feet 8 inches from the floor?		
(j) Changes in Elevation.		
Where means of egress is not subtantially level, are the differences in elevation negotiated by stairs or ramps?		

1910.37 – MEANS OF EGRESS, GENERAL

	YES	NO
(k) Maintenance and Workmanship.		
Are all doors, stairs, ramps, and other components of means of egress made of substantial and reliable construction? (1)		
Are these components all built or installed in a workmanlike manner? (1)		
Are means of egress continuously maintained free of all obstructions? (2)		
If any exit is equipped with any device or alarm so as to restrict the improper use of an exit, is it so installed that it cannot impede or prevent emergency use of such exit? (3)		
(l) Furnishings and Decorations.		
Are furnishings and decorations so placed that they will not obstruct the exits, the access thereto, or the egress therefrom, or the visibility thereof? (1)		
Is the use of explosive or highly flammable furnishings or decorations prohibited? (2)		
(m) Automatic Sprinkler Systems.		
Are all automatic sprinkler systems continuously maintained?		
Are such periodic inspections and tests made?		
(n) Fire Alarm Signaling Systems		
Has the employer assured that fire alarm signaling systems are maintained and tested in accordance with 1910.165(d) in this final standard? (n)		
(o) Fire Retardant Paints.		
Are fire retardant paints or solutions renewed at such intervals as necessary to retain the necessary flame retardant properties?		
(q) Exit Marking.		
Are exits marked by a readily visible sign? (1)		
Is access to exits marked by a readily visible sign? (1)		
Is any door, passage, or stairway which is not intended to be an exit nor a way of exit access so marked by a sign reading "Not an Exit"? (2)		

1910.38 – EMPLOYEE EMERGENCY PLANS AND FIRE PREVENTION PLANS

	YES	NO
Are all signs designating an exit or way of exit access of such size, color, and design as to be readily visible? (3)		
Does every exit sign provide sufficient contrast with the decorations? (4)		
If the direction of travel to reach the nearest exit is not immediately apparent, is a sign reading "Exit" placed, with an arrow indicating the direction? (5)		
Is every exit sign suitably illuminated by a reliable light source giving a value of not less than 5-foot candles on the illuminated surface? (6)		
Are internally illuminated exit signs provided where reduction of normal illumination is permitted? (7)		
In the word "Exit" are the letters on each sign not less than 6 inches high? (8)		
Are the strokes of these letters not less than three-fourths-inch wide? (8)		

1910.38 — EMPLOYEE EMERGENCY PLANS AND FIRE PREVENTION PLANS

(a) Emergency action plan.

	YES	NO
Scope and application (a)(1)		
Paragraph (a) applies to all emergency action plans required by a particular OSHA standard. (a)(1)		
Have you prepared your emergency plan in writing, except as provided in paragraph (a)(5)(iii) of this section? (a)(1)		
Does your plan cover those designated actions employers and employees must take to ensure employee safety from fire and other emergencies? (a)(1)		
Elements.		
Does your plan include the following elements at a minimum:		
Are emergency escape procedures and emergency escape routes assigned? (a)(2)(i)		
Have you provided procedures to be followed by employees who remain to operate critical plant operations before they evacuate? (a)(2)(ii)		
Do you have procedures to account for all employees after emergency evacuation has been completed? (a)(2)(iii)		
Are rescue and medical duties defined for those employees who are to perform them? (a)(2)(iv)		
Have you defined your preferred means of reporting fires and other emergencies? (a)(2)(v)		
Do you have a list of names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan? (a)(2)(vi)		
Alarm system. (a)(3)		
Has the employer established an alarm system which complies with 1910.165? (a)(3)(i)		
Does the alarm system that is used for alerting fire brigade members, or for other purposes, have a distinctive signal for each purpose used? (a)(3)(ii)		

1910.38 – EMPLOYEE EMERGENCY PLANS AND FIRE PREVENTION PLANS

	YES	NO
Evacuation. (a)(4)		
Does the emergency action plan establish the types of evacuation to be used in emergency circumstances? (a)(4)		
Training. (a)(5)		
Before implementing the emergency action plan, has the employer designated and trained a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees? (a)(5)(i)		
Has the employer reviewed the plan with each employee covered by the plan at the following times:		
(a) Initially when the plan is developed? (a)(5)(ii)(a)		
(b) Whenever the employee's responsibilities or designated actions under the plan change? (a)(5)(ii)(b)		
(c) Whenever the plan is changed? (a)(5)(ii)(c)		
Has the employer reviewed with each employee upon initial assignment those parts of the plan which the employee must know to protect the employee in the event of an emergency? (a)(5)(iii)		
Is the written plan kept at the workplace and available for employee review? (a)(5)(iii)		
NOTE: Employers with 10 or fewer employees may communicate the plan orally to employees and the employer need not maintain a written plan. (a)(5)(iii)		
(b) Fire prevention plan.		
Scope and application. (b)(7)		
Paragraph (b) applies to all fire prevention plans required by a particular OSHA standard and shall be in writing, except as provided in the last sentence of paragraph (b)(4)(ii) of this section. (b)(1)		
Elements. (b)(2)		
Are the following elements, at a minimum, included in the fire prevention plan:		
A list of the major workplace fire hazards and their proper handling and storage procedures, potential ignition sources (such as welding, smoking and others) and their control procedures, and the type of fire protection equipment or systems which can control a fire involving them? (b)(2)(i)		
Names or regular job titles of those personnel responsible for maintenance of equipment and systems installed to prevent or control ignitions or fires? (b)(2)(ii)		
Names or regular job titles of those personnel responsible for control of fuel source hazards? (b)(2)(iii)		
Housekeeping. (b)(3)		
Does the employer control accumulations of flammable and combustible waste materials and residues so that they do not contribute to a fire emergency? (b)(3)		
Does the written fire prevention plan include housekeeping procedures? (b)(3)		
Training (b)(4)		
Have all employees been apprised of the fire hazards of the materials and processes to which they are exposed? (b)(4)(i)		

Has the employer reviewed with each employee upon initial assignment those parts of the fire prevention plan which the employee must know to protect the employee in the event of an emergency? **(b)(4)(ii)**

Is the written plan kept in the workplace and available for employee review? **(b)(4)(ii)**

NOTE: Employers with 10 or fewer employees need not maintain a written plan. **(b)(4)(ii)**

Maintenance. **(b)(5)**

Does the employer regularly and properly maintain, according to established procedures, equipment and systems installed on heat producing equipment to prevent accidental ignition of combustible materials? **(b)(5)**

Are the maintenance procedures included in the written fire prevention plan? **(b)(5)**

SUBPART E 1910.38
EMPLOYEE EMERGENCY PLANS

Means of Egress

This appendix serves as a nonmandatory guideline to assist employers in complying with the appropriate requirements of Subpart E.

1. *Emergency action plan elements.* The emergency action plan should address emergencies that the employer may reasonably expect in the workplace. Examples are: fire; toxic chemical releases; hurricanes; tornadoes; blizzards; floods; and others. The elements of the emergency action plan presented in paragraph 1910.38(a)(2) can be supplemented by the following to more effectively achieve employee safety and health in an emergency. The employer should list in detail the procedures to be taken by those employees who have been selected to remain behind to care for essential plant operations until their evacuation becomes absolutely necessary. Essential plant operations may include the monitoring of plant power supplies, water supplies, and other essential services which cannot be shut down for every emergency alarm. Essential plant operations may also include chemical or manufacturing processes which must be shut down in stages or steps where certain employees must be present to assure that safe shut down procedures are completed.

The use of floor plans or workplace maps which clearly show the emergency escape routes should be included in the emergency action plan. Color coding will aid employees in determining their route assignments.

The employer should also develop and explain in detail what rescue and medical first aid duties are to be performed and by whom. All employees are to be told what actions they are to take in these emergency situations that the employer anticipates may occur in the workplace.

2. *Emergency evacuation.* At the time of an emergency, employees should know what type of evacuation is necessary and what their role is in carrying out the plan. In some cases where the emergency is very grave, total and immediate evacuation of all employees is necessary. In other emergencies, a partial evacuation of nonessential employees with a delayed evacuation of others may be necessary for continued plant operation. In some cases, only those employees in the immediate area of the fire may be expected to evacuate or move to a safe area such as when a local application fire suppression system discharge employee alarm is sounded. Employees must be sure that they know what is expected of them in all such emergency possibilities which have been planned in order to provide assurance of their safety from fire or other emergency.

The designation of refuge or safe areas for evacuation should be determined and identified in the plan. In a building divided into fire zones by fire walls, the refuge area may still be within the same building but in a different zone from where the emergency occurs.

Exterior refuge or safe areas may include parking lots, open fields or streets which are located away from the site of the emergency and which provide sufficient space to accommodate the employees. Employees should be instructed to move away from the exit discharge doors of the building, and to avoid congregating close to the building where they may hamper emergency operations.

3. *Emergency action plan training.* The employer should assure that an adequate number of employees are available at all times during working hours to act as evacuation wardens so that employees can be swiftly moved from the danger location to the safe areas. Generally, one warden for each 20 employees in the workplace should be able to provide adequate guidance and instruction at the time of a fire emergency. The employees selected or who volunteer to serve as wardens should be trained in the complete workplace layout and the various alternative escape routes from the workplace. All wardens and fellow employees should be made aware of handicapped employees who may need extra assistance, such as using the buddy system, and of hazardous areas to be avoided during emergencies. Before leaving, wardens should check rooms and other enclosed spaces in the workplace for employees who may be trapped or otherwise unable to evacuate the area.

After the desired degree of evacuation is completed, the wardens should be able to account for or otherwise verify that all employees are in the safe areas.

In buildings with several places of employment, employers are encouraged to coordinate their plans with the other employers in the building. A building-wide or standardized plan for the whole building is acceptable provided that the employers inform their respective employees of their duties and responsibilities under the plan. The standardized plan need not be kept by each employer in the multi-employer building, provided there is an accesible location within the building where the plan can be reviewed by affected employees. When multi-employer building-wide plans are not feasible, employers should coordinate their plans with the other employers within the building to assure that conflicts and confusion are avoided during times of emergencies. In multi-story buildings where more than one employer is on a single floor, it is essential that these employers coordinate their plans with each other to avoid conflicts and confusion.

4. *Fire prevention housekeeping.* The standard calls for the control of accumulations of flammable and combustible waste materials.

It is the intent of this standard to assure that hazardous accumulations of combustible waste materials are controlled so that a fast developing fire, rapid spread of toxic smoke, or an explosion will not occur. This does not necessarily mean that each room has to be swept each day. Employers and employees should be aware of the hazardous properties of materials in their workplaces, and the degree of hazard each poses. Certainly oil soaked rags have to be treated differently than general paper trash in office areas. However, large accumulations of waste paper or corrugated boxes, etc., can pose a significant fire hazard. Accumulations of materials which can cause large fires or generate dense smoke that are easily ignited or may start from spontaneous combustion, are the types of materials with which this standard is concerned. Such combustible materials may be easily ignited by matches, welder's sparks, cigarettes and similar low level energy ignition sources.

5. *Maintenance of equipment under the fire prevention plan.* Certain equipment is often installed in workplaces to control heat sources or to detect fuel leaks. An example is a temperature limit switch often found on deep-fat food fryers found in restaurants. There may be similar switches for high temperature dip tanks, or flame failure and flashback arrester devices on furnaces and similar heat producing equipment. If these devices are not properly maintained or if they become inoperative, a definite fire hazard exists. Again employees and supervisors should be aware of the specific type of control devices on equipment involved with combustible materials in the workplace and should make sure, through periodic inspection or testing, that these controls are operable. Manufacturers' recommendations should be followed to assure proper maintenance procedures.

The following appendices to Subpart L, except Appendix E, serve as nonmandatory guidelines to assist employers in complying with the appropriate requirements of Subpart L.

OVERVIEW: SUBPART F

POWERED PLATFORMS, MANLIFTS AND VEHICLE MOUNTED WORK PLATFORMS

These standards cover various types of powered equipment and devices used for raising, lowering, or otherwise positioning employees to working levels or locations. Subpart F has three major sections:

1910.66 **Powered platforms for building maintenance.**
[Revised 1989] (Checklist pages F-01 thru F-11)

This section covers powered platform installations permanently dedicated to interior or exterior building maintenance of a specific structure or group of structures. Building maintenance includes, but is not limited to, such tasks as:

- Window cleaning
- Caulking
- Metal polishing
- Reglazing

Note: This section does not apply to suspended scaffolds (swinging scaffolds) used to service buildings on a temporary basis and covered under Subpart D of this *manual,* nor to suspended scaffolds used for construction work and covered under Subpart L of 29 CFR Part 1926.

This section applies to all permanent installations completed after July 23, 1990. Major modifications to existing installations completed after that date are also considered new installations under this section.

Permanent installations in existence and/or complete before July 23 1990 shall comply with paragraphs (g), (h), (i), and Appendix C of this section.

In addition, permanent installations completed after August 27, 1971, and in existence and/or completed before July 23, 1990, shall comply with Appendix D of this section.

Building owners of new installations shall inform the employer before each use in writing that the installation meets the requirements of paragraphs (e)(1) and (f)(1) of this section and the additional design criteria contained in other provisions of paragraphs (e) and (f) of this section relating to: required load sustaining capabilities of platforms, building components, hoisting and supporting equipment; stability factors for carriages, platforms and supporting equipment; maximum horizontal force for movement of carriages and davits; design of carriages, hoisting machines, wire rope and stabilization systems; and design criteria for electrical wiring and equipment.

Building owners shall base the information required in paragraph (c)(1) of this section on the results of a field test of the installation before being placed into service and following any major alteration to an existing installation, as required in paragraph (g)(1) of this section. The assurance shall also be based on all other relevant available information, including, but not limited to, test data, equipment specifications and verification by a registered professional engineer.

Building owners of all installations, new and existing, shall inform the employer in writing that the installation has been inspected, tested and maintained in compliance with the requirements of paragraphs (g) and (h) of this section and that all protection anchorages meet the requirements of paragraph (1)(c)(10) of Appendix C.

The employer shall not permit employees to use the installation prior to receiving assurance from the building owner that the installation meets the requirements contained in paragraphs (c)(1) and (c)(3) of this section.

1910.67 **Vehicle-mounted elevating and rotating work platforms.** (Checklist pages F-11 thru F-12)

This standard applies to devices used to elevate personnel to work sites or work operations aboveground. Included in the standard are: Powered or manually operated aerial equipment; extendsible boom platform; vertical towers; or a combination of such devices. Of particular note are those portions of the standard which relate to working in the vicinity of energized overhead lines, preparation for highway travel, use of personal protection devices, inspection procedures, and training.

1910.68 **Manlifts.** (Checklist pages F-12 thru F-15)

This section applies to devices which consist of platforms or brackets and handholds mounted on or attached to an endless belt used to carry personnel only, from floor to floor. The device operates vertically and provides transportation in one direction only.

The definitions on the next page will be helpful in following the requirements of the standards. For convenience the definitions are presented in groupings as they relate to each of the three sections described above.

GENERAL DEFINITIONS — SUBPART F

Definitions applicable to 1910.66, Powered Platforms for Building Maintenance:

Anemometer. An instrument for measuring wind velocity.

Angulated roping. A suspension method where the upper point of suspension is inboard from the attachments on the suspended unit, thus causing the suspended unit to bear against the face of the building.

Building face roller. A rotating cylindrical member designed to ride on the face of the building wall to prevent the platform from abrading the face of the building and to assist in stabilizing the platform.

Building maintenance. Operations such as window cleaning, caulking, metal polishing, reglazing, and general maintenance on building surfaces.

Cable. A conductor, or group of conductors, enclosed in a weatherproof sheath, that may be used to supply electrical power and/or control current for equipment or to provide voice communication circuits.

Carriage. A wheeled vehicle used for the horizontal movement and support of other equipment.

Certification. A written, signed and dated statement confirming the performance of a requirement of this section.

Combination cable. A cable having both steel structural members capable of supporting the platform,and copper or other electrical conductors insulated from each other and the structural members by nonconductive barriers.

Competent person. A person who, because of training and experience, is capable of identifying hazardous or dangerous conditions in powered platform installations and of training employees to identify such conditions.

Continuous pressure. The need for constant manual actuation for a control to function.

Control. A mechanism used to regulate or guide the operation of the equipment.

Davit. A device, used singly or in pairs, for suspending a powered platform from work, storage and rigging locations on the building being serviced. Unlike outriggers, a davit reacts its operating load into a single roof socket or carriage attachment.

Equivalent. Alternative designs, materials or methods which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

Ground rigging. A method of suspending a working platform starting from a safe surface to a point of suspension above the safe surface.

Ground rigged davit. A davit which cannot be used to raise a suspended working platform above the building face being serviced.

Guide button. A building face anchor designed to engage a guide track mounted on a platform.

Guide roller. A rotating cylindrical member, operating separately or as part of a guide assembly, designed to provide continuous engagement between the platform and the building guides or guideways.

Guide shoe. A device attached to the platform designed to provide a sliding contact between the platform and the building guides.

Hoisting machine. A device intended to raise and lower a suspended or supported unit.

Hoist rated load. The hoist manufacturer's maximum allowable operating load.

Installation. All the equipment and all affected parts of a building which are associated with the performance of building maintenance using powered platforms.

Interlock. A device designed to ensure that operations or motions occur in proper sequence.

Intermittent stabilization. A method of platform stabilization in which the angulated suspension wire rope(s) are secured to regularly spaced building anchors.

Lanyard. A flexible line of rope, wire rope or strap which is used to secure the body belt or body harness to a deceleration device, lifeline or anchorage.

Lifeline. A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Live load. The total static weight of workers, tools, parts, and supplies that the equipment is designed to support.

Obstruction detector. A control that will stop the suspended or supported unit in the direction of travel if an obstruction is encountered, and will allow the unit to move only in a direction away from the obstruction.

Operating control. A mechanism regulating or guiding the operation of equipment that ensures a specific operating mode.

Operating device. A device actuated manually to activate a control.

Outrigger. A device, used singly or in pairs, for suspending a working platform from work, storage, and rigging locations on the building being serviced. Unlike davits, an outrigger reacts its operating moment load as at least two opposing vertical components acting into two or more distinct roof points and/or attachments.

Platform rated load. The combined weight of workers, tools, equipment and other material which is permitted to be carried by the working platform at the installation, as stated on the load rating plate.

Poured socket. The method of providing wire rope terminations in which the ends of the rope are held in a tapered socket by means of poured spelter or resins.

Primary brake. A brake designed to be applied automatically whenever power to the prime mover is interrupted or discontinued.

Prime mover. The source of mechanical power for a machine.

Rated load. The manufacturer's recommended maximum load.

Rated strength. The strength of wire rope, as designated by its manufacturer or vendor, based on standard testing procedures or acceptable engineering design practices.

Rated working load. The combined static weight of men, materials, and suspended or supported equipment.

Registered professional engineer. A person who has been duly and currently registered and licensed by an authority within the United States or its territories to practice the profession of engineering.

Roof powered platform. A working platform where the hoist(s) used to raise or lower the platform is located on the roof.

Roof rigged davit. A davit used to raise the suspended working platform above the building face being serviced. This type of davit can also be used to raise a suspended working platform which has been ground-rigged.

Rope. The equipment used to suspend a component of an equipment installation, i.e., wire rope.

Safe surface. A horizontal surface intended to be occupied by personnel, which is so protected by a fall protection system that it can be reasonably assured that said occupants will be protected against falls.

Secondary brake. A brake designed to arrest the descent of the suspended or supported equipment in the event of an overspeed condition.

Self powered platform. A working platform where the hoist(s) used to raise or lower the platform is mounted on the platform.

Speed reducer. A positive type speed reducing machine.

Stability factor. The ratio of the stabilizing moment to the overturning moment.

Stabilizer tie. A flexible line connecting the building anchor and the suspension wire rope supporting the platform.

Supported equipment. Building maintenance equipment that is held or moved to its working position by means of attachment directly to the building or extensions of the building being maintained.

Suspended equipment. Building maintenance equipment that is suspended and raised or lowered to its working position by means of ropes or combination cables attached to some anchorage above the equipment.

Suspended scaffold (swinging scaffold). A scaffold supported on wire or other ropes, used for work on, or for providing access to, vertical sides of strucures on a temporary basis. Such scaffold is not designed for use on a specific structure or group of structures.

Tail line. The nonsupporting end of the wire rope used to suspend the platform.

Tie-in guides. The portion of a building that provides continuous positive engagement between the building and a suspended or supported unit during Its vertical travel on the face of the building.

Traction hoist. A type of hoisting machine that does not accumulate the suspension wire rope on the hoisting drum or sheave, and is designed to raise and lower a suspended load by the application of friction forces between the suspension wire rope and the drum or sheave.

Transportable outriggers. Outriggers designed to be moved from one work location to another.

Trolley carriage. A carriage suspended from an overhead track structure.

Verified. Accepted by design. evaluation, or inspection by a registered professional engineer.

Weatherproof. So constructed that exposure to adverse weather conditions will not affect or interfere with the proper use or functions of the equipment or component.

Winding drum hoist. A type of hoisting machine that accumulates the suspension wire rope on the hoisting drum.

Working platform. Suspended or supported equipment intended to provide access to the face of a building and manned by persons engaged in building maintenance.

Wrap. One complete turn of the suspension wire rope around the surface of a hoist drum.

Definitions applicable to 1910.66, Appendix C, Personal Fall Arrest Systems:

Anchorage. A secure point of attachment for lifelines, lanyards or deceleration devices, and which is independent of the means of supporting or suspending the employee.

Body Belt. A strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.

Body Harness. A design of straps which may be secured about the employee in a manner to distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.

Buckle. Any device for holding the body belt or body harness closed around the employee's body.

Competent Person. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component there of, as well as in their application and use with related equipment.

Connector. A device which is used to couple (connect) parts of the system together. It may be an independent component of the system (such as a carabiner), or an integral component of part of the system (such as a buckle or dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).

Deceleration device. Any mechanism, such as a rope grab, ripstitch lanyard, specially woven lanyard, tearing or deforming lanyard, or automatic self retracting-lifeline/lanyard, which serves to dissipate a substantial amount of energy during a fall arrest, or otherwise limits the energy imposed on an employee during fall arrest.

Deceleration distance. The additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.

Equivalent. Alternative designs, materials or methods which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.

Free fall. The act of falling before the personal fall arrest system begins to apply force to arrest the fall.

Free fall distance. The vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, lifeline and lanyard elongation but includes any deceleration device slide distance or self--retracting lifeline/lanyard extension before they operate and fall arrest forces occur.

Lanyard. A flexible line of rope, wire rope, or strap which is used to secure the body belt or body harness to a deceleration device, lifeline, or anchorage.

Lifeline. A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.

Personal fall arrest system. A system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Qualified person. One with a recognized degree or professional certificate and extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project, or product.

Rope grab. A deceleration device which travels on a lifeline and automatically frictionally engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/lever locking, or both.

Self-retracting lifeline/lanyard. A deceleration device which contains a drum-wound line which may be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.

Snap-hook. A connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snap-hooks are generally one of two types:

1. The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection, OR
2. The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection.

Tie-off. The act of an employee, wearing personal fall protection equipment, connecting directly or indirectly to an anchorage. It also means the condition of an employee being connected to an anchorage.

Definitions applicable to 1910.66, Appendix D, Existing Installations:

Angulated roping. A system of platform suspension in which the upper wire rope sheaves or suspension points are closer to the plane of the building face than the corresponding attachment points on the platform, thus causing the platform to press against the face of the building during its vertical travel.

ANSI. American National Standards Institute.

Babbitted fastenings. The method of providing wire rope attachments in which the ends of the wire strands are bent back and are held in a tapered socket by means of poured molten babbitt metal.

Brake — disc type. A brake in which the holding effect is obtained by frictional resistance between one or more faces of discs keyed to the rotating member to be held and fixed discs keyed to the stationary or housing member (pressure between the discs being applied axially).

Brake — self-energizing band type. An essentially undirectional brake in which the holding effect is obtained by the snubbing action of a flexible band wrapped about a cylindrical wheel or drum affixed to the rotating member to be held, the connections and linkages being so arranged that the motion of the brake wheel or drum will act to increase the tension or holding force of the band.

Brake — shoe type. A brake in which the holding effect is obtained by applying the direct pressure of two or more segmental friction elements held to a stationary member against a cylindrical wheel or drum affixed to the rotating member to be held.

Building face rollers. A specialized form of guide roller designed to contact a portion of the outer face or wall structure of the building, and to assist in stabilizing the operators' platform during vertical travel.

Continuous pressure. Operation by means of buttons or switches, any one of which may be used to control the movement of the working platform or roof car, only as long as the button or switch is manually maintained in the actuating position.

Control. A system governing starting, stopping, direction, acceleration, speed, and retardation of moving members.

Controller. A device or group of devices, usually contained in a single enclosure, which serves to control in some predetermined manner the apparatus to which it is connected.

Electrical ground. A conducting connection between an electrical circuit or equipment and the earth, or some conducting body which serves in place of the earth.

Guide roller. A rotating, bearing-mounted, generally cylindrical member, operating separately or as part of a guide shoe assembly, attached to the platform, and providing rolling contact with building guideways, or other building contact members.

Guide shoe. An assembly of rollers, slide members, or the equivalent, attached as a unit to the operators' platform, and designed to engage with the building members provided for the vertical guidance of the operators' platform.

Interlock. A device actuated by the operation of some other device with which it is directly associated, to govern succeeding operations of the same or allied devices.

Operating device. A pushbutton, lever, or other manual device used to actuate a control.

Powered platform. Equipment to provide access to the exterior of a building for maintenance, consisting of a suspended power-operated working platform, a roof car, or other suspension means, and the requisite operating and control devices.

Rated load. The combined weight of employees, tools, equipment and other material which the working platform is designed and installed to lift.

Relay, direction. An electrically energized contactor responsive to an initiating control circuit, which in turn causes a moving member to travel in a particular direction.

Relay, potential for vertical travel. An electrically energized contactor responsive to initiating control circuit, which in turn controls the operation of a moving member in both directions. This relay usually operates in conjunction with direction relays, as covered under the definition, "relay, direction."

Roof car. A structure for the suspension of a working platform, providing for its horizontal movement to working positions.

Roof-powered platform. A powered platform having the raising and lowering mechanism located on a roof car.

Self-powered platform. A powered platform having the raising and lowering mechanism located on the working platform.

Traveling cable. A cable made up of electrical or communication conductors or both, and providing electrical connection between the working platform and the roof car or other fixed point.

Weatherproof. Equipment so constructed or protected that exposure to the weather will not interfere with its proper operation.

Working platform. The suspended structure arranged for vertical travel which provides access to the exterior of the building or structure.

Yieldpoint. The stress at which the material exhibits a permanent set of 0.2 percent.

Zinced fastenings. The method of providing wire rope attachments in which the splayed or fanned wire ends are held in a tapered socket by means of poured molten zinc.

Definitions applicable to 1910.67, Vehicle-mounted elevating and rotating work platforms:

Aerial device. Any vehicle-mounted device, telescoping or articulating used to position personnel.

Aerial ladder. A device consisting of a single — or multiple-section extensible ladder.

Articulating boom platform. An aerial device with two or more hinged boom sections.

Extensible boom platform. An aerial device (except ladders) with a telescopic or extensible boom platform. Telescopic derricks used with personnel platform attachments shall be considered to be extensible boom platforms.

Insulated aerial device. An aerial device designed for work on energized lines and apparatus.

Mobile unit. A combination aerial device, its vehicle, and related equipment.

Platform. A personnel-carrying device (basket or bucket).

Vehicle. Any carrier that is not manually propelled.

Verticle tower. An aerial device designed to elevate a platform vertically.

Definitions applicable to 1910.68, Manlifts:

Handhold (handgrip). A device attached to the belt which can be grasped by the passenger.

Open type. A handgrip surface capable of being encircled by the passenger's fingers.

Closed type. A cup-shaped handhold device, open at the top into which the passenger may place his fingers.

Limit switch. A device to cut off power to the motor and apply the brake to stop the carrier in the event that a loaded step passes the terminal landing.

Manlift. A device consisting of a power-driven endless belt moving in one direction only, and provided with steps or platforms and handholds for the transportation of personnel from floor to floor.

Rated speed. Speed for which device is designed and installed.

Split-rail switch. An electric limit switch operated mechanically by the rollers on the manlift steps. If the step supports no load, the rollers will "bump" over the switch; if a loaded step should pass over the section, the split rail will be forced straight, tripping the switch and opening the electrical circuit.

Step (platform). A passenger carrying unit.

Travel. The distance between the centers of the top and bottom pulleys.

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[Revised 1989]		
(e) General Requirements **(1)**		
The following requirements apply to affected parts of buildings which utilize working platforms for building maintenance. **(e)(1)**		
Are structural supports, tie-downs, tie-in guides, anchoring devices and any affected parts of the building included in the installation designed by or under the direction of a registered professional engineer experienced in such design? **(e)(1)(i)**		
Are exterior installations capable of withstanding prevailing climatic conditions? **(e)(1)(ii)**		
Does the building installation provide safe access to, and egress from, the equipment? **(e)(1)(iii)**		
Does the building installation provide sufficient space to conduct necessary maintenance of the equipment? **(e)(1)(iii)**		
Do the affected parts of the building have the capability of sustaining all the loads imposed by the equipment? **(e)(1)(iv)**		
Are the affected parts of the building designed so as to allow the equipment to be used without exposing employees to a hazardous condition? **(e)(1)(v)**		
Tie-in Guides **(e)(2)**		
The exterior of each building shall be provided with tie-in guides unless the conditions in paragraph (e)(2)(ii) or (e)(2)(iii) of this section are met. **(e)(2)(i)**		
Note: See Figure 1 in Appendix B of this section for a description of a typical continuous stabilization system utilizing tie-in guides.		
If angulated roping is employed, tie-in guides required in paragraph (e)(2)(i) of this section may be eliminated for not more than 75 feet (22.9 m) of the uppermost elevation of the building, if infeasible due to exterior building design, provided an angulation force of at least 10 pounds (44.4 n) is maintained under all conditions of loading. **(e)(2)(ii)**		
Tie-in guides required in paragraph (e)(2)(i) of this section may be eliminated if one of the guide systems in paragraph (e)(2)(iii)(A), (e)(2)(iii)(B) or (e)(2)(iii)(C) of this section is provided, or an equivalent. **(e)(2)(iii)**		
Intermittent Stabilization System **(e)(2)(iii)(A)**		
Does the system keep the equipment in continuous contact with the building facade? **(e)(2)(iii)(A)**		
Will the system prevent sudden horizontal movement of the platform? **(e)(2)(iii)(A)**		
The system may be used together with continuous positive building guide systems using tie-in guides on the same building, provided the requirements for each system are met. **(e)(2)(iii)(A)**		
Is the maximum vertical interval between building anchors three floors or 50 feet (15.3 m), whichever is less? **(e)(2)(iii)(A)(1)**		
Are building anchors located vertically so that attachment of the stabilizer ties will not cause the platform suspension ropes to angulate the platform horizontally across the face of the building? **(e)(2)(iii)(A)(2)**		

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Are the anchors positioned horizontally on the building face so as to be symmetrical about the platform suspension ropes? **(e)(2)(iii)(A)(2)**		
Are building anchors easily visible to employees? **(e)(2)(iii)(A)(3)**		
Do the building anchors allow a stabilizer tie attachment for each of the platform suspension ropes at each vertical interval? **(e)(2)(iii)(A)(3)**		
If more than two suspension ropes are used on a platform, do the two building-side suspension ropes at the platform ends have a stabilizer attachment? **(e)(2)(iii)(A)(3)**		
Are building anchors which extend beyond the face of the building free of sharp edges or points? **(e)(2)(iii)(A)(4)**		
Where cables, suspension wire ropes and lifelines may be in contact with the building face, are external building anchors free from interfering with their handling or operation? **(e)(2)(iii)(A)(4)**		
Are the intermittent stabilization system building anchors and components capable of sustaining without failure at least four times the maximum anticipated load applied or transmitted to the components and anchors? **(e)(2)(iii)(A)(5)**		
If two anchors share the wind load, is the minimum design wind load for each anchor 300 (1334 n) pounds? **(e)(2)(iii)(A)(5)**		
Are the building anchors and stabilizer ties capable of sustaining anticipated horizontal and vertical loads from winds specified for roof storage design which may act on the platform and wire ropes if the platform is stranded on a building face? **(e)(2)(iii)(A)(6)**		
If the building anchors have different spacing than the suspension wire rope or if the building requires different suspension spacings on one platform, are one building anchor and stabilizer tie capable of sustaining the wind loads? **(e)(2)(iii)(A)(6)**		
Note: See Figure 2 in Appendix B of this section for a description of a typical intermittent stabilization system.		
Button Guide Stabilization System **(e)(2)(iii)(B)**		
Are guide buttons coordinated with platform-mounted equipment of paragraph (f)(5)(vi) of this section? **(e)(2)(iii)(B)(1)**		
Are guide buttons located horizontally on the building face so as to allow engagement of each of the guide tracks mounted on the platform? **(e)(2)(iii)(B)(2)**		
Are guide buttons located in vertical rows on the building face for proper engagement of the guide tracks mounted on the platform? **(e)(2)(iii)(B)(3)**		
Are two guide buttons engaged on each guide track at all times except for the initial engagement? **(e)(2)(iii)(B)(4)**		
Are the guide buttons which extend beyond the face of the building free of sharp edges or points? **(e)(2)(iii)(B)(5)**		
Where cables, ropes and lifelines may be in contact with the building face, do guide buttons not interfere with their handling or operation? **(e)(2)(iii)(B)(5)**		

Are guide buttons, connections and seals capable of sustaining without damage at least the weight of the platform?

OR

Is provision made in the guide tracks or guide track connectors to prevent the platform and its attachments from transmitting the weight of the platform to the guide buttons, connections and seals? **(e)(2)(iii)(B)(6)**

In either case, is the minimum design load 300 pounds (1334 n) per building anchor? **(e)(2)(iii)(B)(6)**

Note: See paragraph (f)(5)(vi) of this section for relevant equipment provisions.

Note: See Figure 3 in Appendix B of this section for a description of a typical button guide stabilization system.

System Utilizing Angulated Roping and Building Face Rollers **(e)(2)(iii)(C)**

Does the system shall keep the equipment in continuous contact with the building facade? **(e)(2)(iii)(C)**

Does the system prevent sudden horizontal movement of the platform? **(e)(2)(iii)(C)**

This system is acceptable only where the suspended portion of the equipment in use does not exceed 130 feet (39.6 m) above a safe surface or ground level, **AND** where the platform maintains no less than 10 pounds (44.4 n) angulation force on the building facade. **(e)(2)(iii)(C)**

Tie-in guides for building interiors (atriums) may be eliminated when a registered professional engineer determines that an alternative stabilization system, including systems in paragraphs (e)(2)(iii) (A), (B) and (C), or a platform tie-off at each work station will provide equivalent safety. **(e)(2)(iv)**

Roof Guarding **(e)(3)**

Are employees working on roofs while performing building maintenance protected by a perimeter guarding system which meets the requirements of paragraph (c)(1) of Section 1910.23 of this Part? **(e)(3)(i)**

Is the perimeter guard not more than six inches (152 mm) inboard of the inside face of a barrier, i.e. the parapet wall, or roof edge curb of the building being serviced; **AND** does the perimeter guard location not exceed an 18-inch (457 mm) setback from the exterior building face? **(e)(3)(ii)**

Equipment Stops **(e)(4)**

Are operational areas for trackless type equipment provided with structural stops, such as curbs, to prevent equipment from traveling outside its intended travel areas and to prevent a crushing or shearing hazard? **(e)(4)**

Maintenance Access **(e)(5)**

Are means provided to traverse all carriages and their suspended equipment to a safe area for maintenance and storage? **(e)(5)**

Elevated Track **(e)(6)**

Is an elevated track system, which is located four feet (1.2 m) or more above a safe surface and traversed by carriage supported equipment, provided with a walkway and guardrail system? **(e)(6)(i)**

OR

Is the working platform capable of being lowered, as part of its normal operation, to the lower safe surface for access and egress of the personnel

AND

Is the platform provided with a safe means of access and egress to the lower safe surface? **(e)(6)(ii)**

Tie-down Anchors **(e)(7)**

Are imbedded tie-down anchors, fasteners, and affected structures resistant to corrosion? **(e)(7)**

Cable Stabilization **(e)(8)**

Are hanging lifelines and all cables not in tension stabilized at each 200 foot (61 m) interval of vertical travel of the working platform beyond an initial 200 foot (61 m) distance? **(e)(8)(i)**

Are hanging cables, other than suspended wire ropes, which are in constant tension stabilized when the vertical travel exceeds an initial 600 foot (183 m) distance. and at further intervals of 600 feet (183 m) or less? **(e)(8)(ii)**

Emergency Planning **(e)(9)**

Has a written emergency action plan been developed and implemented for each kind of working platform operation? **(e)(9)**

Does this plan explain the emergency procedures which are to be followed in the event of a power failure, equipment failure or other emergencies which may be encountered? **(e)(9)**

Does the plan also explain that employees inform themselves about the building emergency escape routes, procedures and alarm systems before operating a platform? **(e)(9)**

Upon initial assignment and whenever the plan is changed does the employer review with each employee those parts of the plan which the employee must know to protect himself or herself in the event of an emergency? **(e)(9)**

Building Maintenance **(e)(10)**

Do repairs or major maintenance of those building portions that provide primary support for the suspended equipment not affect the capability of the building to meet the requirements of this standard? **(e)(10)**

Electrical Requirements **(e)(11)**

The following electrical requirements apply to buildings which utilize working platforms for building maintenance. **(e)(11)**

> General building electrical installations shall comply with Section 1910.302 through 1910.308 of this Part, unless otherwise specified in this section; **(e)(11)(i)**

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	YES	NO
Building electrical wiring shall be of such capacity that when full load is applied to the equipment power circuit not more than a five percent drop from building service-vault voltage shall occur at any power circuit outlet used by equipment regulated by this section; **(e)(11)(ii)**		
The equipment power circuit shall be an independent electrical circuit that shall remain separate from all other equipment within or on the building, other than power circuits used for hand tools that will be used, in conjunction with the equipment. If the building is provided with an emergency power system, the equipment power circuit may also be connected to this system; **(e)(11)(iii)**		
The power circuit shall be provided with a disconnect switch that can be locked in the "OFF" and "ON" positions. The switch shall be conveniently located with respect to the primary operating area of the equipment to allow the operators of the equipment access to the switch; **(e)(11)(iv)**		
The disconnect switch for the power circuit shall be locked in the "ON" position when the equipment is in use; **(e)(11)(v)** **AND** An effective two-way voice communication system shall be provided between the equipment operators and persons stationed within tile building being serviced. The communications facility shall be operable and shall be manned at all times by persons stationed within the building whenever the platform is being used. **(e)(11)(vi)**		
(f) Powered Platform Installations — Equipment *General Requirements* **(f)(1)** The following requirements apply to equipment which are part of a powered platform installation, such as platforms, stabilizing components, carriages, outriggers, davits, hoisting machines, wire ropes and electrical components. **(f)(1)**		
Are equipment installations designed by or under the direction of a registered professional engineer experienced in such design? **(f)(1)(i)**		
Does the design provide for a minimum live load of 250 pounds (113.6 kg) for each occupant of a suspended or supported platform? **(f)(1)(ii)**		
Is equipment that is exposed to wind when not in service designed to withstand forces generated by winds of at least 100 miles per hour (44.7 m/s) at 30 feet (9.2 m) above grade? **(f)(1)(iii)**		
Is equipment that is exposed to wind when in service designed to withstand forces generated by winds of at least 50 miles per hour (22.4 m/s) for all elevations? **(f)(1)(iv)**		
Construction Requirements **(f)(2)** Are bolted connections self-locking or otherwise secured to prevent loss of the connections by vibration? **(f)(2)**		
Suspension Methods **(f)(3)** Is elevated building maintenance equipment suspended by a carriage, outriggers, davits or an equivalent method? **(f)(3)**		

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	YES	NO
Carriages **(f)(3)(i)** Carriages used for suspension of elevated building maintenance equipment must comply with the following: **(f)(3)(i)**		
Is the horizontal movement of a carriage controlled so as to ensure its safe movement and allow accurate positioning of the platform for vertical travel or storage? **(f)(3)(i)(A)**		
Do powered carriages not exceed a traversing speed of 50 feet per minute (0.3 m/s)? **(f)(3)(i)(B)**		
Does the initiation of a traversing movement for a manually propelled carriage on a smooth level surface not require a person to exert a horizontal force greater than 40 pounds (444.8 n)? **(f)(3)(i)(C)**		
Are structural stops and curbs provided to prevent the traversing of the carriage beyond its designed limits of travel? **(f)(3)(i)(D)**		
Are traversing controls for a powered carriage of a continuous pressure weatherproof type? **(f)(3)(i)(E)**		
Are multiple controls when provided arranged to permit operation from only one control station at a time? **(f)(3)(i)(E)**		
Is an emergency stop device provided on each end of a powered carriage for interrupting power to the carriage drive motors? **(f)(3)(i)(E)**		
Are the operating controls so connected that in the case of suspended equipment, traversing of a carriage is not possible until the suspended portion of the equipment is located at its uppermost designed position for traversing; and is free of contact with the face of the building or building guides? **(f)(3)(i)(F)**		
In addition, are all protective devices and interlocks in the proper position to allow traversing of the carriage? **(f)(3)(i)(F)**		
Is stability for underfoot supported carriages obtained by gravity, by anattachment to a structural support, or by a combination of gravity and a structural support? **(f)(3)(i)(G)**		
Is the use of flowing counterweights to achieve stability prohibited? **(f)(3)(i)(G)**		
Is the stability factor against overturning not less than two for horizontal traversing of the carriage, including the effects of impact and wind? **(f)(3)(i)(G)(1)**		
Are the carriages and their anchorages capable of resisting accidental over-tensioning of the wire ropes suspending the working platform? **(f)(3)(i)(G)(2)**		
Does this calculated value include the effect of one and one-half times the stall capacity of the hoist motor? **(f)(3)(i)(G)(2)**		
Are all parts of the installation capable of withstanding, without damage to any part of the installation, the forces resulting from the stall load of the hoist and one half the wind load? **(f)(3)(i)(G)(2)**		
Are roof carriages which rely on having tie-down devices secured to the building to develop the required stability against overturning provided with an interlock which will prevent vertical platform movement unless the tie-down is engaged? **(f)(3)(i)(G)(3)**		

	YES	NO
Is an automatically applied braking or locking system, or equivalent, provided that will prevent unintentional traversing of power traversed or power assisted carriages? **(f)(3)(i)(H)**		
Is a manual or automatic braking or locking system or equivalent, provided that will prevent unintentional traversing of manually propelled carriages? **(f)(3)(i)(I)**		
Is a means to lock out the power supply for the carriage provided? **(f)(3)(i)(J)**		
Is safe access to and egress from the carriage provided from a safe surface? **(f)(3)(i)(K)**		
If the carriage traverses an elevated area, is any operating area on the carriage protected by a guardrail system in compliance with the provisions of paragraph (f)(5)(i)(F) of this section? **(f)(3)(i)(K)**		
Is any access gate self-closing and self-latching, or provided with an interlock? **(f)(3)(i)(K)**		
Is each carriage work station position identified by location markings and/or position indicators? **(f)(3)(i)(L)**		
Do the motors stall if the load on the hoist motors is at any time in excess of three times that necessary for lifting the working platform with its rated load? **(f)(3)(i)(M)**		
Transportable Outriggers **(f)(3)(ii)**		
Transportable outriggers may be used as a method of suspension for ground rigged working platforms where the point of suspension does not exceed 300 feet (91.5 m) above a safe surface. Tie-in guide system(s) shall be provided which meet the requirements of paragraph (e)(2) of this section. **(f)(3)(ii)(A)**		
Are transportable outriggers used only with self-powered, ground rigged working platforms? **(f)(3)(ii)(B)**		
Is each transportable outrigger secured with a tie-down to a verified anchorage on the building during the entire period of its use? **(f)(3)(ii)(C)**		
Is the anchorage designed to have a stability factor of not less than four against overturning or upsetting of the outrigger? **(f)(3)(ii)(C)**		
Is access to and egress from the working platform from and to a safe surface below the point of suspension? **(f)(3)(ii)(D)**		
Is each transportable outrigger designed for lateral stability to prevent roll-over in the event an accidental lateral load is applied to the outrigger? **(f)(3)(ii)(E)**		
Is the accidental lateral load to be considered in this design not less than 70 percent of the rated load of the hoist? **(f)(3)(ii)(E)**		
Is each transportable outrigger designed to support an ultimate load of not less than four times the rated load of the hoist? **(f)(3)(ii)(F)**		
Is each transportable outrigger so located that the suspension wire ropes for two point suspended working platforms are hung parallel? **(f)(3)(ii)(G)**		
Is a transportable outrigger tied-back to a verified anchorage on the building with a rope equivalent in strength to the suspension rope? **(f)(3)(ii)(H)**		
Is the tie-back rope installed parallel to the centerline of the outrigger? **(f)(3)(ii)(I)**		

	YES	NO
Davits **(f)(3)(iii)**		
Is every davit installation, fixed or transportable, rotatable or non-rotatable designed and installed to insure that it has a stability factor against overturning of not less than four? **(f)(3)(iii)(A)**		
Are the following requirements applying to roof rigged davit systems met: **(f)(3)(iii)(B)**		
Are access to and egress from the working platform from a safe surface? **(f)(3)(iii)(B)(1)**		
Does access or egress require persons to climb over a building's parapet or guard railing? **(f)(3)(iii)(B)(1)**		
Is the working platform provided with wheels, casters or a carriage for traversing horizontally? **(f)(3)(iii)(B)(2)**		
Are the following requirements applying to ground rigged davit systems met?: **(f)(3)(iii)(C)**		
Does the point of suspension not exceed 300 feet (91.5 m) above a safe surface? **(f)(3)(iii)(C)(1)**		
Are guide system(s) provided which meet the requirements of paragraph (e)(2) of this section? **(f)(3)(iii)(C)(1)**		
Are access and egress to and from the working platform only from a safe surface below the point of suspension? **(f)(3)(iii)(C)(2)**		
Does a rotating davit not require a horizontal force in excess of 40 pounds (177.9 n) per person to initiate a rotating movement? **(f)(3)(iii)(D)**		
Are the following requirements which apply to transportable davits met?: **(f)(3)(iii)(E)**		
Is a davit or part of a davit weighing more than 80 pounds (36 kg) provided with a means for its transport, which shall keep the center of gravity of the davit at or below 36 inches (914 mm) above the safe surface during transport? **(f)(3)(iii)(E)(1)**		
Is a davit provided with a pivoting socket or with a base that will allow the insertion or removal of a davit at a position of not more than 35 degrees above the horizontal, with the complete davit inboard of the building face being serviced? **(f)(3)(iii)(E)(2)**		
Are means provided to lock the davit to its socket or base before it is used to suspend the platform? **(f)(3)(iii)(E)(3)**		
Hoisting Machines **(f)(4)**		
Are raising and lowering of suspended or supported equipment performed only by a hoisting machine? **(f)(4)(i)**		
Is each hoisting machine capable of arresting any overspeed descent of the load? **(f)(4)(ii)**		
Is each hoisting machine powered only by air, electric or hydraulic sources? **(f)(4)(iii)**		
Are flammable liquids not carried on the working platform? **(f)(4)(iv)**		
Is each hoisting machine capable of raising or lowering 125 percent of the rated load of the hoist? **(f)(4)(v)**		
Are the moving parts of a hoisting machine enclosed or guarded in compliance with paragraphs (a)(1) and (2) of 1910.212 of this part? **(f)(4)(vi)**		

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	YES	NO
Are winding drums, traction drums and sheaves, and directional sheaves used in conjunction with hoisting machines compatible with, and sized for, the wire rope used? **(f)(4)(vii)**		
Is each winding drum provided with a positive means of attaching the wire rope to the drum? **(f)(4)(viii)**		
Is the attachment capable of developing at least four times the rated load of the hoist? **(f)(4)(viii)**		
Is each hoisting machine provided with a primary brake and at least one independent secondary brake, each capable of stopping and holding not less than 125 percent of the lifting capacity of the hoist? **(f)(4)(ix)**		
Is the primary brake directly connected to the drive train of the hoisting machine, and not connected through belts, chains, clutches, or set screw type devices? **(f)(4)(ix)(A)**		
Is the brake automatically set when power to the prime mover is interrupted? **(f)(4)(ix)(A)**		
Is the secondary brake an automatic emergency type of brake that, if actuated during each stopping cycle, will not engage before the hoist is stopped by the primary brake? **(f)(4)(ix)(B)(1)**		
When a secondary brake is actuated, does it stop and hold the platform within a vertical distance of 24 inches (609.6 mm)? **(f)(4)(ix)(B)(2)**		
Is any component of a hoisting machine which requires lubrication for its protection and proper functioning provided with a means for that lubrication to be applied? **(f)(4)(x)**		
Suspended Equipment **(f)(5)**		
General Requirements **(f)(5)(i)**		
Is each suspended unit component, except suspension ropes and guardrail systems, capable of supporting, without failure, at least four times the maximum intended live load applied or transmitted to that component? **(f)(5)(i)(A)**		
Is each suspended unit component constructed of materials that will withstand anticipated weather conditions? **(f)(5)(i)(B)**		
Is each suspended unit provided with a load rating plate, conspicuously located, stating the unit weight and rated load of the suspended unit? **(f)(5)(i)(C)**		
When the suspension points on a suspended unit are not at the unit ends, is the unit capable of remaining continuously stable under all conditions of use and position of the live load? **(f)(5)(i)(D)**		
When the suspension points on a suspended unit are not at the unit ends, does the unit maintain at least a 1.5 to 1 stability factor against unit upset? **(f)(5)(i)(D)**		
Are guide rollers, guide shoes or building face rollers provided? **(f)(5)(i)(E)**		
Do the guide rollers, guide shoes or building face rollers compensate for variations in building dimensions and for minor horizontal out-of-level variations of each suspended unit? **(f)(5)(i)(E)**		
Is each working platform of a suspended unit secured to the building facade by one or more of the following methods, or by an equivalent method?: **(f)(5)(i)(F)**		
Is there continuous engagement to building anchors as provided in paragraph (e)(2)(i) of this section? **(f)(5)(i)(F)(1)**		

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	YES	NO
Is there intermittent engagement to building anchors as provided in paragraph (e)(2)(iii)(A) of this section? **(f)(5)(i)(F)(2)**		
Is there button guide engagement as provided in paragraph (e)(2)(iii)(B) of this section? **(f)(5)(i)(F)(3)**		
OR		
Is there angulated roping and building face rollers as provided in paragraph (e)(2)(iii)(C) of this section? **(f)(5)(i)(F)(4)**		
Does each working platform of a suspended unit provided with a guardrail system on all sides meet the following requirements?: **(f)(5)(i)(G)**		
Does the system consist of a top guardrail, midrail, and a toeboard? **(f)(5)(i)(G)(1)**		
Is the top guardrail not less than 36 inches (914 mm) high and able to withstand at least a 100 pound (444 n) force in any downward or outward direction? **(f)(5)(i)(G)(2)**		
Is the midrail able to withstand at least a 75-pound (333 n) force in any downward or outward direction? **(f)(5)(i)(G)(3)**		
AND		
Are the areas between the guardrail and toeboard on the ends and outboard side, and the area between the midrail and toeboard on the inboard side, closed with a material that is capable of withstanding a load of 100 pounds (45.4 KG.) applied horizontally over any area of one square foot (.09 m(2))? **(f)(5)(i)(G)(4)**		
Does the material have all openings small enough to reject passage of life lines and potential falling objects which may be hazardous to persons below? **(f)(5)(i)(G)(4)**		
Are toeboards capable of withstanding, without failure, a force of at least 50 pounds (222 n) applied in any downward or horizontal direction at any point along the toeboard? **(f)(5)(i)(G)(5)**		
Are toeboards three and one-half inches (9 cm) minimum in length from their top edge to the level of the platform floor? **(f)(5)(i)(G)(6)**		
Are toeboards securely fastened in place at the outermost edge of the platform and have no more than one-half inch (1.3 cm) clearance above the platform floor? **(f)(5)(i)(G)(7)**		
Are toeboards solid or with an opening not over one inch (25 cm) in the greatest dimension? **(f)(5)(i)(G)(8)**		
Two and Four-Point Suspended Working Platforms		
(f)(5)(ii) Is the working platform not less than 24 inches (610 mm) wide and provided with a minimum of a 12-inch (305 mm) wide passage at or past any obstruction on the platform? **(f)(5)(ii)(A)**		
Is the flooring of a slip-resistant type? **(f)(5)(ii)(B)**		
Is there no opening in the flooring that would allow the passage of life lines, cables and other potential falling objects? **(f)(5)(ii)(B)**		
If a larger opening is provided, is it protected by placing a material under the opening which shall prevent the passage of life lines, cables and potential falling objects? **(f)(5)(ii)(B)**		
Is the working platform provided with a means of suspension that will restrict the platform's inboard to outboard roll about its longitudinal axis to a maximum of 15 degrees from a horizontal plane when moving the live load from the inboard to the outboard side of the platform? **(f)(5)(ii)(C)**		

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Is any cable suspended from above the platform provided with a means for storage to prevent accumulation of the cable at the floor of the platform? **(f)(5)(ii)(D)**		
Are all operating controls for the vertical travel of the platform of the continuous-pressure type, and located on the platform? **(f)(5)(ii)(E)**		
Is each operating station of every working platform provided with a means of interrupting the power supply to all hoist motors to stop any further powered ascent or descent of the platform? **(f)(5)(ii)(F)**		
Does the maximum rated speed of the platform not exceed 50 feet per minute (0.3 ms) with single speed hoists, nor 75 feet per minute (0.4 ms) with multi-speed hoists? **(f)(5)(ii)(G)**		
Are provisions made for securing all tools, water tanks, and other accessories to prevent their movement or accumulation on the floor of the platform? **(f)(5)(ii)(H)**		
Are portable fire extinguishers conforming to the provisions of 1910.155 and 1910.157 of this part provided and securely attached on all working platforms? **(f)(5)(ii)(I)**		
Are access to and egress from a working platform, except for those that land directly on a safe surface, provided by stairs, ladders, platforms and runways conforming to the provisions of Subpart D of this part? **(f)(5)(ii)(J)**		
Are access gates self-closing and self-latching? **(f)(5)(ii)(J)**		
Are means of access to or egress from a working platform which is 48 inches (1.2 m) or more above a safe surface provided with a guardrail system or ladder handrails that conform to the provisions of Subpart D of this part? **(f)(5)(ii)(K)**		
Is the platform provided with a secondary wire rope suspension system if the platform contains overhead structures which restrict the emergency egress of employees? **(f)(5)(ii)(L)**		
Is a horizontal lifeline or a direct connection anchorage provided, as part of a fall arrest system which meets the requirements of Appendix C, for each employee on such a platform? **(f)(5)(ii)(L)**		
Is a vertical lifeline provided as part of a fall arrest system which meets the requirements of Appendix C, for each employee on a working platform suspended by two or more wire ropes, if the failure of one wire rope or suspension attachment will cause the platform to upset? **(f)(5)(ii)(M)**		
If a secondary wire rope suspension is used, vertical lifelines are not required for the fall arrest system, provided that each employee is attached to a horizontal lifeline anchored to the platform. **(f)(5)(ii)(M)**		
Is an emergency electric operating device provided on roof powered platforms near the hoisting machine for use in the event of failure of the normal operating device located on the working platform, or failure of the cable connected to the platform? **(f)(5)(ii)(N)**		
Is the emergency electric operating device mounted in a secured compartment, and is the compartment labeled with instructions for use? **(f)(5)(ii)(N)**		
Is a means for opening the compartment mounted in a break-glass receptacle located near the emergency electric operating device or in an equivalent secure and accessible location? **(f)(5)(ii)(N)**		

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Single Point Suspended Working Platforms **(f)(5)(iii)** The requirements of paragraphs (f)(5)(ii)(A) through (K) of this section shall also apply to a single point working platform. **(f)(5)(iii)(A)**		
Is each single point suspended working platform provided with a secondary wire rope suspension system, which will prevent the working platform from falling should there be a failure of the primary means of support or if the platform contains overhead structures which restrict the egress of the employees? **(f)(5)(iii)(B)**		
Is a horizontal life line or a direct connection anchorage provided, as part of a fall arrest system which meets the requirements of Appendix C, for each employee on the platform? **(f)(5)(iii)(B)**		
Ground-Rigged Working Platforms **(f)(5)(iv)** Do all groundrigged working platforms comply with all the requirements of paragraphs (f)(5)(ii) (A) through (M) of this section? **(f)(5)(iv)(A)**		
After each day's use, is the power supply within the building disconnected from a ground-rigged working platform and the platform either disengaged from its suspension points or secured and stored at grade? **(f)(5)(iv)(B)**		
Intermittently Stabilized Platforms **(f)(5)(v)** Does the platform comply with paragraphs (F)(5)(ii)(A) through (M) of this section? **(f)(5)(v)(A)**		
Is each stabilizer tie for attachment to the building anchor, equipped with a "quick connect-quick disconnect" device which cannot be accidentally disengaged and which is resistant to adverse environmental conditions? **(f)(5)(v)(B)**		
Is the platform provided with a stopping device that will interrupt the hoist power supply in the event the platform contacts a stabilizer tie during its ascent? **(f)(5)(v)(C)**		
Are building face rollers not placed at the anchor setting if exterior anchors are used on the building face? **(f)(5)(v)(D)**		
Do stabilizer ties used on intermittently stabilized platforms allow for the specific attachment length needed to effect the predetermined angulation of the suspended wire rope? **(f)(5)(v)(E)**		
Is the specific attachment length maintained at all building anchor locations? **(f)(5)(v)(E)**		
Is the platform in continuous contact with the face of the building during ascent and descent? **(f)(5)(v)(F)**		
Do the attachment and removal of stabilizer ties require the horizontal movement of the platform? **(f)(5)(v)(G)**		
Are the platform-mounted equipment and its suspension wire ropes not physically damaged by the loads from the stabilizer tie or its building anchor? **(f)(5)(v)(H)**		
Are the platform, platform-mounted equipment and wire ropes able to withstand a load that is at least twice the ultimate strength of the stabilizer tie? **(f)(5)(v)(H)**		
Note: See Figure II in Appendix B of this section for a description of a typical intermittent stabilization system.		

Button-Guide Stabilized Platforms **(f)(5)(vi)**

Does the platform comply with paragraphs (f)(5)(ii)(A) through (M) of this section? **(f)(5)(vi)(A)**

Does each guide track on the platform engage a minimum of two guide buttons during any vertical travel of the platform following the initial button engagement? **(f)(5)(vi)(B)**

Is each guide track on a platform that is part of a roof rigged system provided with a storage position on the platform? **(f)(5)(vi)(C)**

Is each guide track on the platform sufficiently maneuverable by platform occupants to permit easy engagement of the guide buttons, and easy movement into and out of its storage position on the platform? **(f)(5)(vi)(D)**

Are two guide tracks mounted on the platform? **(f)(5)(vi)(E)**

Do the two guide tracks provide continuous contact with the building face? **(f)(5)(vi)(E)**

Are the load carrying components of the button guide stabilization system which transmit the load into the platform capable of supporting the weight of the platform, or is provision made in the guide track connectors or platform attachments to prevent the weight of the platform from being transmitted to the platform attachments? **(f)(5)(vi)(F)**

Note: See Figure III in Appendix B of this section for a description of a typical button guide stabilization system.

Supported Equipment **(f)(6)**

Does supported equipment maintain a vertical position in respect to the face of the building by means other than friction? **(f)(6)(i)**

Are cog wheels or equivalent means incorporated to provide climbing traction between the supported equipment and the building guides? **(f)(6)(ii)**

Are additional guide wheels or shoes incorporated as may be necessary to ensure that the drive wheels are continuously held in positive engagement with the building guides? **(f)(6)(ii)**

Are launch guide mullions indexed to the building guides and retained in alignment with the building guides used to align drive wheels entering the building guides? **(f)(6)(iii)**

Do manned platforms used on supported equipment comply with the requirements of paragraphs (f)(5)(ii)(A), (f)(5)(ii)(B), and (f)(5)(ii)(D) through (K) of this section covering suspended equipment? **(f)(6)(iv)**

Suspension Wire Ropes and Rope Connections **(f)(7)**

Does each specific installation use suspension wire ropes or combination cable and connections meeting the specification recommended by the manufacturer of the hoisting machine used? **(f)(7)(i)**

Are connections capable of developing at least 80 percent of the rated breaking strength of the wire rope? **(f)(7)(i)**

Does each suspension rope have a "Design Factor" of at least 10? **(f)(7)(ii)**

The "Design Factor" is the ratio of the rated strength of the suspension wire rope to the rated working load, and shall be calculated using the following formula:

$$F = \frac{S(N)}{W}$$

Where:

F = Design factor

S = Manufacturer's rated strength of one suspension rope

N = Number of suspension ropes under load

W = Rated working load on all ropes at any point of travel **(f)(7)(ii)**

Is the suspension wire rope grade at least improved plow steel or equivalent? **(f)(7)(iii)**

Are suspension wire ropes sized to conform with the required design factor, but not less than 5/16 inch (7.94 mm) in diameter? **(f)(7)(iv)**

Is no more than one reverse bend in six wire rope lays permitted? **(f)(7)(v)**

Is a corrosion-resistant tag securely attached to one of the wire rope fastenings when a suspension wire rope is to be used at a specific location and will it remain in that location? **(f)(7)(vi)**

Does this tag bear the following wire rope data:

(A) The diameter (inches and/or mm);
(B) Construction classification;
(C) Whether non-preformed or preformed;
(D) The grade of material;
(E) The manufacturer's rated strength;
(F) The manufacturer's name;
(G) The month and year the ropes were installed; and
(H) The name of the person or company which installed the ropes? **(f)(7)(vi)(A through H)**

Is a new tag installed at each rope renewal? **(f)(7)(vii)**

Is the original tag stamped with the date of the resocketing, or the original tag retained and a supplemental tag provided when ropes are resocketed? **(f)(7)(viii)**

Does the supplemental tag show the date of resocketing and the name of the person or company that resocketed the rope? **(f)(7)(viii)**

Do winding drum type hoists contain at least three wraps of the suspension wire rope on the drum when the suspended unit has reached the lowest possible point of its vertical travel? **(f)(7)(ix)**

Are traction drum and sheave type hoists provided with a wire rope of sufficient length to reach the lowest possible point of vertical travel of the suspended unit, and an additional length of the wire rope of at least four feet (1.2 m)? **(f)(7)(x)**

Is the lengthening or repairing of suspension wire ropes prohibited? **(f)(7)(xi)**

Are babbitted fastenings for suspension wire rope prohibited? **(f)(7)(xii)**

Control Circuits, Power Circuits and Their Components **(f)(8)**

Does electrical wiring and equipment comply with Subpart S of this Part, except as otherwise required by this section? **(f)(8)(i)**

Are electrical runway conductor systems of a type designed for use in exterior locations? **(f)(8)(ii)**

Are electrical runway conductor systems located so that they do not come into contact with accumulated snow or water? **(f)(8)(ii)**

Are cables protected against damage resulting from overtensioning or from other causes? **(f)(8)(iii)**

Are devices included in the control system for the equipment which will provide protection against electrical overloads, three phase reversal and phase failure? **(f)(8)(iv)**

Does the control system have a separate method, independent of the direction control circuit, for breaking the power circuit in case or an emergency or malfunction? **(f)(8)(iv)**

Does suspended or supported equipment have a control system which will require the operator of the equipment to follow predetermined procedures? **(f)(8)(v)**

The following requirements shall apply to electrical protection devices: **(f)(8)(vi)**

On installations where the carriage does not have a stability factor of at least four against overturning, is an electrical contact(s) provided and so connected that the operating devices for the suspended or supported equipment shall be operative only when the carriage is located and mechanically retained at an established operating point? **(f)(8)(vi)(A)**

Is overload protection provided in the hoisting or suspension system to protect against the equipment operating in the "up" direction with a load in excess of 125 percent of the rated load of the platform? **(f)(8)(vi)(B)**

Is an automatic detector provided for each suspension point that will interrupt power to all hoisting motors for travel in the "down" direction, and apply the primary brakes if any suspension wire rope becomes slack? **(f)(8)(vi)(C)**

Is a continuous-pressure rigging-bypass switch designed for use during rigging permitted? **(f)(8)(vi)(C)**

Is the switch only used during rigging? **(f)(8)(vi)(C)**

Are upper and lower directional switches designed to prevent the travel of suspended units beyond safe upward and downward levels provided? **(f)(8)(vii)**

Are emergency stop switches provided on remote controlled, roof-powered manned platforms adjacent to each control station on the platform? **(f)(8)(viii)**

Do cables which are in constant tension have overload devices which will prevent the tension in the cable from interfering with the load limiting device required in paragraph (f)(8)(vi)(B) of this section, or with the platform roll limiting device required in paragraph (f)(5)(ii)(C) of this section? **(f)(8)(ix)**

Is the setting of these devices coordinated with other overload settings at the time of design of the system and clearly indicated on or near the device? **(f)(8)(ix)**

Does the device interrupt the equipment travel in the "down" direction? **(f)(8)(ix)**

(g) Inspection and Tests

Installations and Alterations **(g)(1)**

Have all completed building, maintenance equipment installations been inspected and tested in the field before being placed in initial service to determine that all parts of the installation conform to applicable requirements of this standard, and that all safety and operating equipment is functioning as required? **(g)(1)**

Are an inspection and test made following any major alteration to an existing installation? **(g)(1)**

Is no hoist in an installation subjected to a load in excess of 125 percent of its rated load? **(g)(1)**

Periodic Inspections and Tests **(g)(2)**

Do related building supporting structures undergo periodic inspection by a competent person at intervals not exceeding 12 months? **(g)(2)(i)**

Are all parts of the equipment including control systems inspected, and, where necessary, tested by a competent person at intervals specified by the manufacturer/supplier, but not to exceed 12 months, to determine that they are in safe operating condition? **(g)(2)(ii)**

Are parts subject to wear, such as wire ropes, bearing, gears, and governors inspected and/or tested to determine that they have not worn to such an extent as to affect the safe operation of the installation? **(g)(2)(ii)**

Does the building owner keep a certification record of each inspection and test required under paragraphs (g)(2)(i) and (ii) of this section? **(g)(2)(iii)**

Does the certification record include the date of the inspection, the signature of the person who performed the inspection, and the number, or other identifier, of the building support structure and equipment which was inspected? **(g)(2)(iii)**

Is this certification record kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer? **(g)(2)(iii)**

Are working platforms and their components inspected by the employer for visible defects before every use and after each occurrence which could affect the platform's structural integrity? **(g)(2)(iv)**

Maintenance Inspections and Tests **(g)(3)**

Is a maintenance inspection and, where necessary, a test made of each platform installation every 30 days? **(g)(3)(i)**

Where the work cycle is less than 30 days, is such inspection and/or test made prior to each work cycle? **(g)(3)(i)**

Does this inspection and test follow procedures recommended by the manufacturer? **(g)(3)(i)**

Is the inspection and test made by a competent person? **(g)(3)(i)**

Does the building owner keep a certification record of each inspection and test performed under paragraph (g)(3)(i) of this section? **(g)(3)(ii)**

Does the certification record include the date of the inspection and test, the signature of the person who performed the inspection and/or test, and an identifier for the platform installation which was inspected? **(g)(3)(ii)**

Is the certification record kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer? **(g)(3)(ii)**

Special Inspection of Governors and Secondary Brakes **(g)(4)**

Are governors and secondary brakes inspected and tested at intervals specified by the manufacturer/supplier but not to exceed every 12 months? **(g)(4)(i)**

Do the results of the inspection and test confirm that the initiating device for the secondary braking system operates at the proper overspeed? **(g)(4)(ii)**

Do the results of the inspection and test confirm that the secondary brake is functioning properly? **(g)(4)(iii)**

If any hoisting machine or initiating device for the secondary brake system is removed from the equipment for testing, are all reinstalled and directly related components reinspected prior to returning the equipment installation to service? **(g)(4)(iv)**

Is the inspection of governors and secondary brakes performed by a competent person? **(g)(4)(v)**

Is the secondary brake governor and actuation device tested before each day's use? **(g)(4)(vi)**

Where testing is not feasible, is a visual inspection of the brake made instead to ensure that it is free to operate? **(g)(4)(vi)**

Suspension Wire Rope Maintenance, Inspection and Replacement **(g)(5)**

Is suspension wire rope maintained and used in accordance with procedures recommended by the wire rope manufacturer? **(g)(5)(i)**

Is suspension wire rope inspected by a competent person for visible defects and gross damage to the rope before every use and after each occurrence which might affect the wire rope's integrity? **(g)(5)(ii)**

Is a thorough inspection of suspension wire ropes in service made once a month? **(g)(5)(iii)**

Do suspension wire ropes that have been inactive for 30 days or longer have a thorough inspection before they are placed into service? **(g)(5)(iii)**

Are these thorough inspections of suspension wire ropes performed by a competent person? **(g)(5)(iii)**

Is the need for replacement of a suspension wire rope determined by inspection and based on the condition of the wire rope? **(g)(5)(iv)**

Any of the following conditions or combination of conditions will be cause for removal of the wire rope:

(A) Broken wires exceeding three wires in one strand or six wires in one rope lay;

(B) Distortion of rope structure such as would result from crushing or kinking;

(C) Evidence of heat damage;

(D) Evidence of rope deterioration from corrosion;

(E) A broken wire within 18 inches (460.8 mm) of the end attachments;

(F) Noticeable rusting and pitting;

(G) Evidence of core failure (a lengthening of rope lay, protrusion of the rope core and a reduction in rope diameter suggests core failure); or

(H) More than one valley break (broken wire).

(I) Outer wire wear exceeds one-third of the original outer wire diameter.

(J) Any other condition which the competent person determines has significantly affected the integrity of the rope. **(g)(5)(iv)(A through J)**

Does the building owner keep a certification record of each monthly inspection of a suspension wire robe as required in paragraph (g)(5)(iii) of this section? **(g)(5)(v)**

Does the record include the date of the inspection, the signature of the person who performed the inspection, and a number, or other identifier, of the wire rope which was inspected? **(g)(5)(v)**

Is this record of inspection made available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative and by the employer? **(g)(5)(v)**

Hoist Inspection **(g)(6)**

Before lowering personnel below the top elevation of the building, is the hoist tested each day in the lifting direction with the intended load to make certain it has sufficient capacity to raise the personnel back to the boarding level? **(g)(6)**

(h) Maintenance

General Maintenance **(h)(1)**

Are all parts of the equipment affecting safe operation maintained in proper working order so that they may perform the functions for which they were intended? **(h)(1)**

Is the equipment taken out of service when it is not in proper working order? **(h)(1)**

Cleaning **(h)(2)**

Are control or power contactors and relays kept clean? **(h)(2)(i)**

Are all other parts kept clean if their proper functioning would be affected by the presence of dirt or other contaminants? **(h)(2)(ii)**

T5

Periodic Resocketing of Wire Rope Fastenings **(h)(3)**

Are hoisting ropes utilizing poured socket fastenings resocketed at the non-drum ends at intervals not exceeding 24 months? **(h)(3)(i)**

In resocketing the ropes, is a sufficient length cut from the end of the rope to remove damaged or fatigued portions? **(h)(3)(i)**

Do resocketed ropes conform to the requirements of paragraph (f)(7) of this section? **(h)(3)(ii)**

Are limit switches affected by the resocketed ropes reset, if necessary? **(h)(3)(iii)**

Periodic Reshackling of Suspension Wire, Ropes **(h)(4)**

Are the hoisting ropes reshackled at the nondrum ends at intervals not exceeding 24 months? **(h)(4)**

When reshackling the ropes, is a sufficient length cut from the end of the rope to remove damaged or fatigued portions? **(h)(4)**

Roof Systems **(h)(5)**

Are roof track systems, tie-downs, or similar equipment maintained in proper working order so that they perform the function for which they were intended? **(h)(5)**

Building Face Guiding Members **(h)(6)**

Are T-rails, indented mullions, or equivalent guides located in the face of a building maintained in proper working order so that they perform the functions for which they were intended? **(h)(6)**

Are brackets for cable stabilizers similarly maintained in proper working order? **(h)(6)**

Inoperative Safety Devices **(h)(7)**

No person shall render a required safety device or electrical protective device inoperative, except as necessary for tests, inspections, and maintenance. Immediately upon completion of such tests, inspections and maintenance, the device must be restored to its normal operating condition. **(h)(7)**

(i) Operations

Training **(i)(1)**

Are working platforms operated only by persons who are proficient in the operation, safe use and inspection of the particular working platform to be operated? **(i)(1)(i)**

Are all employees who operate working platforms trained in the following:

(A) Recognition of, and preventive measures for, the safety hazards associated with their individual work tasks.

(B) General recognition and prevention of safety hazards associated with the use of working platforms, including the provisions in the section relating to the particular working platform to be operated.

(C) Emergency action plan procedures required In paragraph (e)(9) of this section.

(D) Work procedures required in paragraph (i)(1)(iv) of this section.

(E) Personal fall arrest system inspection, care, use and system performance? **(i)(1)(ii)(A through E)**

Is training of employees in the operation and inspection of working platforms done by a competent person? **(i)(1)(iii)**

Are written work procedures for the operation, safe use and inspection of working platforms provided for employee training? **(i)(1)(iv)**

Pictorial methods of instruction, may be used, in lieu of written work procedures, if employee communication is improved using this method. The operating manuals supplied by manufacturers for platform system components can serve as the basis for these procedures. **(i)(1)(iv)**

Does the employer certify that employees have been trained in operating and inspecting a working platform by preparing a certification record which includes the identity of the person trained, the signature of the employer or the person who conducted the training and the date that training was completed? **(i)(1)(v)**

Is the certification record prepared at the completion of the training required in paragraph (i)(1)(ii) of this section, and maintained in a file for the duration of the employee's employment? **(i)(1)(v)**

Is the certification record kept readily available for review by the Assistant Secretary of Labor or the Assistant Secretary's representative? **(i)(1)(v)**

Use **(i)(2)**

Are working platforms not loaded in excess of the rated load, as stated on the platform load rating plate? **(i)(2)(i)**

Are employees prohibited from working on snow, ice, or other slippery material covering platforms, except for the removal of such materials? **(i)(2)(ii)**

Are adequate precautions taken to protect the platform, wire ropes and life lines from damage due to acids or other corrosive substances, in accordance with the recommendations of the corrosive substance producer, supplier, platform manufacturer or other equivalent information sources? **(i)(2)(iii)**

Are platform members which have been exposed to acids or other corrosive substances washed down with a neutralizing solution, at a frequency recommended by the corrosive substance producer or supplier? **(i)(2)(iii)**

Are platform members, wire ropes and life lines protected when using a heat producing process? **(i)(2)(iv)**

Are wire ropes and life lines which have been contacted by the heat-producing process considered to be permanently damaged and not be used? **(i)(2)(iv)**

Is the platform not operated in winds in excess of 25 miles per hour (40.2 km/hr) except to move it from an operating to a storage position? **(i)(2)(v)**

Is wind speed determined based on the best available information, which includes on-site anemometer readings and local weather forecasts which predict wind velocities for the area? **(i)(2)(v)**

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YES NO

On exterior installations, is an anemometer mounted on the platform to provide information of on-site wind velocities prior to and during the use of the platform? (i)(2)(vi)

The anemometer may be a portable (hand held) unit which is temporarily mounted during platform use. (i)(2)(vi)

Are tools, materials and debris not related to the work in progress not allowed to accumulate on platforms? (i)(2)(vii)

Are stabilizer ties located so as to allow unencumbered passage along the full length of the platform? (i)(2)(vii)

Are the stabilizer ties of such length so as not to become entangled in rollers, hoists or other machinery? (i)(2)(vii)

(j) Personal Fall Protection

Are employees on working platforms protected by a personal fall arrest system meeting the requirements of Appendix C, Section I, of this standard, and as otherwise provided by this standard? (j)

(k) Effective Date

This section is effective January 24, 1990. (k)

(The information collection requirements contained in this section are approved by the Office of Management and Budget (OMB) and listed under OMB control number 1218-0121.) (k)

1910.67 — VEHICLE-MOUNTED ELEVATING AND ROTATING WORK PLATFORMS

(b) General Requirements.

Are all aerial devices (aerial lifts) that were acquired on or after July 1, 1975 designed and constructed in conformance with the requirements of ANSI standard A92.2-1969? (1)

Have all aerial lifts acquired before July 1, 1975, that did not meet the ANSI standard A92.2-1969, been modified? (1)

NOTE: Aerial devices include:

(1) Extensible boom platforms
(2) Aerial ladders
(3) Articulating boom platforms
(4) Vertical towers
(5) A combination of any of the above.

Are all "field modifications" approved and certified by the manufacturer or a nationally recognized testing laboratory? (2)

NOTE: The requirements of this section do not apply to firefighting equipment, except that the vehicle must be a stable support for the aerial device. (3)

When operating aerial lifts proximate to, under, over, by or near electric power lines, are the following clearances maintained? (4)

At least 10 feet from lines rated at 50 kv or less? (4)(i)(A)

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YES NO

At least 10 feet plus 0.4 inch for each kilovolt in excess of 50 kv, or twice the length of the line insulator but never less than 10 feet? (4)(i)(B)

NOTE: The above requirements do not apply where the aerial device is insulated for the work and when the work is performed by telecommunication, line clearance tree-trimming or electric utility employees. (4)(i)(C)

NOTE: The requirements **A** and **B** above do not apply when the electric transmission or distribution lines have been de-energized and visibly grounded at the point of work or where insulating barriers, not a part of or an attachment to the aerial device, have been erected to prevent physical contact with the lines.

NOTE: Proximity warning devices may be used, but cannot be in lieu of the distance requirement in (b)(4)(i)(A) and (B) above. (4)(ii)

Are provisions made whereby the owner of the lines is notified and provided with all pertinent information prior to commencement of operation near electrical lines? (4)(iii)

Are all overhead wires considered to be energized until the owner of the line states that it has been deenergized? (4)(iv)

(c) Specific Requirements — *Ladder Trucks and Tower Trucks.* (c)(i)

Prior to highway travel are vehicles with aerial devices inspected to ensure that aerial ladders are secured in the lower traveling position and locked in place by the manually operated device at the base of the ladder or other effective means? (1)

Extensible and articulating boom platforms (c)(2)

Are lift controls tested each day prior to use, to ensure that they are in safe working condition? (2)(i)

Are only trained persons authorized to operate an aerial lift? (2)(ii)

Is belting off to an adjacent pole, structure or equipment prohibited while working from an aerial device? (2)(iii)

Are employees always required to stand on the floor of the basket? (2)(iv)

Are employees prohibited from sitting or climbing onto the edge of the basket? (2)(iv)

Are employees instructed **not** to use planks, ladders or other devices for a work position? (2)(iv)

Is a body belt with lanyard provided, required to be worn, and attached to the boom or basket when working from an aerial lift? (2)(v)

Are provisions made to ensure that manufacturer's load limits are not exceeded? (2)(vi)

Are provisions made to ensure that brakes are set and that outriggers, when used, are positioned on pads or a solid surface? (2)(vii)

Are precautions taken to ensure that wheel chocks are installed before using an aerial lift on an incline? (2)(viii)

	YES	NO
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Are aerial lift trucks prohibited from being moved while the boom is elevated with personnel in the basket? (2)(viii)		
Do articulating boom and extensible platforms that are primarily designed as personnel carriers have both upper (platform) and lower controls? (2)(ix)		
Are the upper controls located in, or beside the platform within easy reach of the operator? (2)(ix)		
Do the lower controls provide for overriding the upper controls? (2)(ix)		
Are controls plainly marked as to their function? (2)(ix)		
Are provisions made to ensure that the lower controls are not activated without first obtaining permission of the employee on the platform? (2)(ix)		
Are climbers prohibited from being worn by employees working from an aerial lift? (2)(x)		
Are provisions made to ensure that the insulated portions of aerial lifts are not altered? (2)(xi)		
Are provisions made for inspecting booms to ensure that they are properly cradled prior to moving the aerial lift? (except as provided in (c)(2)(viii) above) (2)(xii)		
Electrical Tests. (c)(3)		
Are electrical tests made in conformance with Section 5 of ANSI A92.2-1969? (3)		
Bursting Safety Factor. (c)(4)		
Do all critical hydraulic and pneumatic components comply with the provisions of ANSI A92.2-1969, Section 4.9? (4)		
Do all noncritical components have a bursting safety factor of at least two to one? (4)		
Welding Standards. (c)(5)		
Does all welding conform to the following Automotive Welding Society (AWS) standards: (5)		
AWS B3.0-41 (Standard Qualification Procedure)? (5)(i)		
AWS D8.4-61 (Recommended Practices for Automotive Welding Design)? (5)(ii)		
AWS D10.9-69 (Standard Qualification of Welding Procedures and Welders for Piping and Tubing)? (5)(iii)		
AWS D2.0-69 (Specifications for Welding Highway and Railroad Bridges)? (5)(iv)		
1910.68 — MANLIFTS		
(b) General Requirements.		
Do all manlift installations installed after August 31, 1971 comply with the design requirements of ANSI A90.1-1969? (2)		
Floor Openings. (b)(5)		
Are the floor openings for both the "up" and "down" runs regardless of the width of the belt, at least 24 inches but not more than 28 inches from the face of the belt? (5)(i)		

	YES	NO
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On a 12-inch wide belt is the floor opening at least 28 inches but not more than 36 inches wide? (5)(i)		
On a 14-inch wide belt is the floor opening at least 34 inches but not more than 38 inches wide? (5)(i)		
On a 16-inch wide belt is the floor opening at least 36 inches but not more than 40 inches wide? (5)(i)		
Are all floor openings for each manlift uniform in size and approximately circular? (5)(ii)		
Is each floor opening located vertically above the opening below it? (5)(ii)		
Landings. (b)(6)		
Is the clearance between the floor or mounting platform and the required conical guard at least 7 feet 6 inches? (6)(i)		
Is the landing space adjacent to the floor openings kept free from obstruction and kept clear at all times? (6)(ii)		
Is the landing space at all floor openings at least 2 feet in width from the edge of the floor opening? (6)(ii)		
Is adequate lighting, of not less than 5 foot candles, provided at each floor landing at all times when the lift is in operation? (6)(iii)		
Are the landing surfaces at entrances and exits to the manlift constructed and maintained to provide safe footing at all times? (6)(iv)		
If the travel of the manlift is in excess of 50 feet between floor landings, are there emergency landings provided so that there will be a landing every 25 feet or less of manlift travel? (6)(v)		
Are emergency landings accessible from both the "up" and "down" rungs of the manlift? (6)(v)(a)		
Is the metal fixed ladder accessible from all emergency landings? (6)(v)(a)		
Are all emergency landings provided with a standard railing and toeboard? (6)(v)(b)		
Underside Guarding of Floor Openings. (b)(7)		
Fixed Type Guards. (b)(7)(i)		
Is the angle of the cone not less than 45° with the horizontal? (7)(i)(a)		
If ceiling heights permit, is the angle of the cone at least 60° or greater from the horizontal? (7)(i)(a)		
Does the lower edge of the guard extend at least 42 inches outward from any handhold on the belt? (7)(i)(b)		
Is the cone fabricated from not less than No. 18 U.S. Gauge sheet steel or material of equivalent strength or stiffness? (7)(i)(c)		
Is the lower edge of the cone rolled to a minimum diameter of one-half inch? (7)(i)(c)		
Is the interior of the cone smooth with no rivets, bolts, or screws protruding? (7)(i)(c)		
If a fixed guard is not provided, is one of a floating type in place? (7)(ii)		

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	YES	NO
Are the floating cones mounted on hinges at least 6 inches below the underside of the floor? (7)(ii)		
Are floating guards so constructed as to actuate a limit switch should a force of 2 pounds be applied on the edge of the cone closest to the hinge? (7)(ii)		
Protection of Entrances and Exits. (b)(8)		
Are all entrances and exits at all floor landings affording access to the manlift guarded by a maze or a handrail equipped with self-closing gates? (8)(i)		
Are rails constructed as standard guardrails with toeboards meeting the requirements of ANSI A12.1-1967, and the items listed in Sec. 1910.23 of this checklist? (8)(ii)		
If gates are used, do they open outward and are they of the self-closing type? (8)(iii)		
If gates are used, are the corners rounded? (8)(iii)		
If a maze or staggered openings are used, are they so constructed so as to prevent direct passage between the enclosure and outer floor space? (8)(iv)		
Are all entrances at all landings in the same relative position at each floor level? (8)(v)		
Are these enclosures provided with self-closing spring-locked doors? (8)(vi)		
Are only authorized personnel allowed to have keys to these doors? (8)(vi)		
Guards for Openings. (b)(9)		
Are all floor openings guarded on sides not used for entrance or exit, or by a wall, railing and toeboard, or by panels of wire mesh of suitable strength? (9)(i)		
If floor openings are guarded by rails, are they at least 42 inches high on the up-running side and 66 inches high on the down-running side of the manlift? (9)(ii)		
Bottom Arrangement. (b)(10)		
Is the clear area at the bottom landing at least as big as the areas enclosed by guardrails on the floors above? (10)(i)		
Is there at least 48 inches from the face of the belt provided on the down-running side of the belt at the bottom landing? (10)(i)		
Is the lower pulley of the belt so installed that it is supported by the lowest landing served? (10)(ii)		
Are the sides of the bottom pulley support so constructed that it will not contact the pulley or the steps? (10)(ii)		
If the bottom floor or platform is not at the level of the manlift step when it completes its turn around the pulley and assumes a horizontal position, is a mounting platform provided in front of or to one side of the uprun at the lowest landing level? (10)(iii)		
Is the area on the downside of the manlift provided with guardrails to prevent persons from walking under a descending step? (10)(iv)		
Is the area between the belt and the platform provided with guardrails to prevent persons from getting caught between the mounting platform and an ascending step? (10)(iv)		

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	YES	NO
Top Arrangements. (b)(11)		
Is there at least an 11-foot clearance above the top terminal landing and the overhead? (11)(i)		
Is there a horizontal clearance maintained that is at least 2 feet larger cylindrically than the diameter of the floor opening through the plane of the belt face? (11)(i)		
Does this cylindrical clearance extend from the floor to the ceiling on the uprunning side of the belt? (11)(i)		
Are the necessary steps provided to exclude the protrusion into this cylindrical plane of any structural or machine supporting members? (11)(i)		
Is there at least 5 feet of clearance between the center of the head pulley shaft and any ceiling obstruction? (11)(i)(a)		
Is the center of the head pulley shaft at least 6 feet above the top terminal landing? (11)(i)(b)		
When the distance to the head pulley is over 6 feet above the top landing, is there an emergency grab bar or rail and platform provided to permit the rider to swing free should the emergency stops become inoperative? (11)(iii)		
When the head pulley is less than 6 feet above the top landing, is there a grab bar or rail provided to permit the rider to swing free should the emergency stops become inoperative? (11)(iii)		
Is there a fixed metal ladder accessible from both the "up" and "down" run of the manlift provided for the entire travel of the manlift? (12)		
Does this ladder comply with Sec. 1910.27? (12)		
Are manlift rails secured in such a manner so as to avoid spreading, vibration, and misalignment? (13)		
Illumination. (b)(14)		
Are both runs of the manlift illuminated at all times when the lift is in operation? (14)(i)		
Is the intensity of this illumination not less than 1-foot candle, except where required to have 5-foot candles at the landings? (14)(i)		
Are lighting circuits for manlift runways permanently tied in to the building circuits without switches? (14)(ii)		
If switches are provided, are there separate switches at each landing, and will any switch turn on all the lights necessary to illuminate the entire runway? (14)(ii)		
Is the entire manlift and its driving mechanism protected from the weather at all times? (15)		
(c) Mechanical Requirements.		
Do the brakes for stopping and holding a manlift require power from an external source to cause disengagement? (1)(i)		
Is the brake electrically released? (1)(i)		
Is the brake applied to the motor shaft for direct-connected units? (1)(i)		
Is the brake applied to the input shaft for belt-driven units? (1)(i)		

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	YES	NO
Is the brake capable of stopping and holding the manlift when the descending side is loaded with 250 pounds on each step? (1)(i)		
Are belts made up of hard-woven canvas, rubber-coated canvas, leather, or other material meeting the strength of the standards required in ANSI A90.1-1969? (1)(ii)		
Do belts made up of other than hard-woven canvas, rubber-coated canvas, or leather have a coefficient of friction such that when used in conjunction with an adequate tensioning device it will meet the brake requirements as indicated in (c)(1)(i)? (1)(ii)(a)		
For a manlift travel not exceeding 100 feet is the belt width at least 12 inches? (1)(ii)(b)		
For a manlift with a travel between 100 and 150 feet is the belt width not less than 14 inches? (1)(ii)(b)		
For manlifts having a travel exceeding 150 feet is the belt width not less than 16 inches? (1)(ii)(b)		
Is the splicing of belts that have become torn prohibited? (1)(ii)(c)		
Speed. (c)(2)		
Is the use of manlifts with speeds in excess of 80 feet per minute prohibited? (2)		
Platforms or Steps. (c)(3)		
Are the steps or platforms not less than 12 inches nor more than 14 inches deep? (3)(i)		
Is the width of the step or platform not less than the width of the belt to which it is attached? (3)(ii)		
Is the distance between steps equally spaced and not less than 16 feet, measured from the upper surface of one step to the upper surface of the next step above it? (3)(iii)		
Does the surface of the step make an approximate right angle with the "up" and "down" run of the belt? (3)(iv)		
Does the material used as a step have an inherent nonslip characteristic, with a coefficient of friction of not less than 0.5? (3)(v)		
Are step frames or supports and their guides of adequate strength to prevent disengagement of the step roller, prevent appreciable misalignment, and visible deformation of the steps or its support, when subjected to a load of 400 pounds applied at the approximate center of the step? (3)(vi)		
Are there handholds both above and below each step that is provided on the belt? (3)(vii)		
When a step is removed either permanently or for repairs, are the handholds immediately above and below removed before the lift is again placed in service? (3(vii)		
Handholds. (c)(4)		
Are handholds attached to the belt and installed so that they are not less than 4 feet nor more than 4 feet 8 inches above the step tread on both the "up" and "down" runs of the belt? (4)(i)		
Is the grab surface of the handhold not less than 4½ inches wide and not less than 3 inches deep? (4)(ii)		

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	YES	NO
Is there a clearance of at least 2 inches from the belt provided on each handhold? (4)(ii)		
Are fastenings for handholds not less than 1 inch from the edge of the belt? (4)(ii)		
Are handholds capable of withstanding, without damage, a load of 300 pounds applied parallel to the run of the belt? (4)(iii)		
If a handhold is removed permanently or temporarily, is the corresponding step and handhold for the opposite direction of travel also removed? (4)(iv)		
Are all handholds of the closed type? (4)(v)		
Up Limit Stops. (c)(5)		
Are there two separate automatic stop devices provided to cut off the power and apply the brake when a loaded step passes the upper terminal landing? (5)(i)		
Does one of these separate automatic stop devices consist of a split-rail switch, mechanically operated by the step roller, and located not more than 6 inches above the top terminal landing? (5)(i)		
Does the second automatic stop device consist of any of the following: (5)(i)		
A split-rail switch placed 6 inches above and on the side opposite the first limit switch? (5)(i)(a)		
An electronic device? (5)(i)(b)		
A switch actuated by a lever, rod, or plate, the latter to be placed on the "up" side of the head pulley so as to clear a passing step? (5)(i)(c)		
After the manlift has been stopped by an automatic stop device, is it required to reset the automatic stop manually? (5)(ii)		
Is the automatic stop device so located that a person resetting it will have a clear view of both the "up" and the "down" runs fo the manlift? (5)(ii)		
Is the automatic stop device so located so that it cannot be reset from any step or platform? (5)(ii)		
Does the initial limit stop device function so that the manlift will be stopped before the loaded step has reached a point 24 inches above the top terminal landing? (5)(iii)		
Electrical Requirements. (c)(5)(iv)		
Are switches which open the main motor circuit directly of the multipole type? (5)(iv)(a)		
Where electronic devices are used, are they so designed and installed that their failure will result in shutting off the power to the driving motor? (5)(iv)(b)		
Where flammable vapors or dusts are present, are all electrical installations in accordance with the National Fire Protection Association 70-1971, the National Electrical Code? (5)(iv)(c)		
Are all controller contacts other than of the oil-immersed type carrying the main motor current of copper to carbon or equal, with the exception of where the circuit is broken at two or more points simultaneously? (5)(iv)(d)		

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YES NO

Emergency Stop. (c)(6)

Are emergency stop means provided? (6)(i)

Is the emergency stop means within easy reach of the ascending and descending runs of the belt? (6)(ii)

Is this emergency stop means so connected with the control lever or operating mechanism that it will cut off the power and apply the brake when pulled in the direction of travel? (6)(iii)

If rope is used to activate the emergency stop, is it at least three-eighths inch in diameter? (6)(iv)

Is the use of wire rope prohibited for this emergency stop means? (6)(iv)

Instructions and Warning Signs. (c)(7)

Are signs of conspicuous and easily read style, giving instructions for use of the manlift, provided at each landing or stenciled on the belt? (7)(i)

Do the instructions read approximately as follows?

Face the belt
Use the Handholds
To Stop – Pull Rope (7)(i)(b)

Is there an illuminated sign on the top floor bearing the following wording:

Top Floor – Get Off (7)(ii)(a)

Does this illuminated sign have letters not less than 2 inches in height? (7)(ii)(a)

Is this sign so located as to be within easy view of an ascending passenger, and not more than 2 feet above the top terminal landing? (7)(ii)(a)

Is there also a red warning light provided immediately below the upper landing terminal, and so located as to shine in the passenger's face? (7)(ii)(b)

Is there a conspicuous sign displayed at each landing with the following legend:

AUTHORIZED PERSONNEL ONLY

(d) Operating Rules.

Are manlifts used only for lifting personnel? (1)

NOTE: No freight, packaged goods, pipe, lumber or construction material of any kind shall be handled on manlift.

(e) Periodic Inspection.

Are manlifts inspected by a competent designated person at intervals of not more than 30 days? (1)

Are limit switches checked on a weekly basis? (1)

Are manlifts, which are found to be unsafe, prevented from being operated until they are properly repaired? (1)

Does the periodic inspection cover at least the following items: (2)

Steps?
Step Fastenings?

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YES NO

Rails?
Rail Supports and Fastenings?
Rollers and Slides?
Belt and Belt Tension?
Handholds and Fastenings?
Floor Landings?
Guardrails?
Lubrication?
Limit Switches?
Warning Signs and Lights?
Illumination?
Drive Pulley?
Bottom (boot) Pulley and Clearance?
Pulley Supports?
Motor?
Driving Mechanism?
Brake?
Electrical Switches?
Vibration and Misalignment?
"Skip" on Up or Down run when mounting steps (indicating worn gears).

Is a certification record kept of each inspection which includes the date of the inspection, the signature of the person who performed the inspection, and the serial number or other identifier of the manlift that was inspected? (3)

Is this record available for inspection by the assistant secretary of labor or an authorized representative? (3)

1910.69 — SOURCES OF STANDARDS

Section	Source
1910.66	ANSI A120.1–1970 Safety Code for Powered Platforms for Exterior Building Maintenance.
1910.67	ANSI A92.2–1969 American National Standard for Vehicle-Mounted Elevating and Rotating Work Platforms.
1010.68	ANSI A90.1–1969 Safety Code for Manlifts.

1910.70 — STANDARDS ORGANIZATIONS

Specific Standards referenced in this subpart may be obtained from the issuing organization.

American National Standards Institute
1430 Broadway, N.Y.C. 10018

American Welding Society
2501 N.W. 7th Street
Miami, Florida 33125

Appendix A to Section 1910.66, Guidelines (Advisory)

[Added 1989]

1. *Use of the Appendix*

Appendix A provides examples of equipment and methods to assist the employer in meeting the requirements of the indicated provision of the standard. Employers may use other equipment or procedures which conform to the requirements of the standard. This appendix neither adds to nor detracts from the mandatory requirements set forth in 1910.66

2. *Assurance*

Paragraph (c) of the standard requires the building owner to inform the employer in writing that the powered platform installation complies with certain requirements of the standard, since the employer may not have the necessary information to make these determinations. The employer, however, remains responsible for meeting these requirements which have not been set off in paragraph (c)(1).

3. *Design Requirements*

The design requirements for each installation should be based on the limitations (stresses, deflections, etc.), established by nationally recognized standards as promulgated by the following organizations, or to equivalent standards:

AA — The Aluminum Association, 818 Connecticut Avenue, NW., Washington, DC, 20006 Aluminum Construction Manual Specifications For Aluminum Structures Aluminum Standards and Data

AGMA — American Gear Manufacturers Association, 101 North Fort Meyer Dr., Suite 1000, Arlington, VA 22209

AISC — American Institute of Steel Construction, 400 North Michigan Avenue, Chicago, IL 60611

ANSI — American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018

ASCE — American Society of Civil Engineers, 345 East 47th Street, New York, NY 10017

ASME — American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017

ASTM — American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

AWS — American Welding Society, Inc.. Box 351040, 550 NW. LeJeunne Road, Miami, FL 33126

JIC — Joint Industrial Council, 2139 Wisconsin Avenue NW.. Washington. DC 20007

NEMA — National Electric Manufacturers Association, 2101 L Street, NW., Washington, DC 20037

4. *Tie-in Guides*

Indented mullions, T-rails or other equivalent guides are acceptable as tie-in guides in a building face for a continuous stabilization system. Internal guides are embedded in other building members with only the opening exposed (see Figure 1 of Appendix B). External guides, however, are installed external to the other building members and so are fully exposed. The minimum opening for tie-in guides is three-quarters of an inch (19 mm), nd the minimum inside dimensions are one-inch (25 mm) deep and two inches (50 mm) wide.

Employers should be aware of the hazards associated with tie-in guides in a continuous stabilization system which was not designed properly. For example, joints in these track systems may become extended or discontinuous due to installation or building settlement. If this alignment problem is not corrected, the system could jam when a guide roller or guide shoe strikes a joint and this would cause a hazardous situation for employees. In another instance, faulty design will result in guide rollers being mounted in a line so they will jam in the track at the slightest misalignment.

5. *Building anchors (Intermittent Stabilization System)*

In the selection of the vertical distance between building anchors, certain factors should be given consideration. These factors include building height and architectural design, platform length and weight, wire rope angulation, and the wind velocities in the building area. Another factor to consider is the material of the building face, since this material may be adversely affected by the building rollers.

External or indented type building anchors are acceptable. Receptacles in the building facade used for the indented type should be kept clear of extraneous materials which will hinder their use. During the inspection of the platform installation, evidence of a failure or abuse of the anchors should be brought to the attention of the employer.

6. *Stabilizer Tie Length*

A stabilizer tie should be long enough to provide for the planned angulation of the suspension cables. However, the length of the tie should not be excessive and become a problem by possibly becoming entangled In the building face rollers or parts of the platform machinery.

The attachment length may vary due to material elongation and this should be considered when selecting the material to be used. Consideration should also be given to the use of ties which are easily installed by employees, since this will encourage their use.

7. *Intermittent Stabilization System*

Intermittent stabilization systems may use different equipment, tie-in devices and methods to restrict the horizontal movement of it powered platform with respect to the face of the building.

One acceptable method employs corrosion-resistant building anchors secured in the face of the building in vertical rows every third floor or 50 feet (15.3 m), whichever is less. The anchors are spaced horizontally to allow a stabilization attachment (stabilizer tie) for each of the two platform suspension wire ropes. The stabilizer tie consists of two parts. One part is a quick connect-quick disconnect device which utilizes a corrosion-resistant yoke and retainer spring that is designed to fit over the building anchors. The second part of the stabilizer tie is a lanyard which is used to maintain a fixed distance between the suspension wire rope and the face of the building.

In this method, as the suspended powered platform descends past the elevation of each anchor, the descent is halted and each of the platform occupants secures a stabilizer tie between a suspension wire rope and a building anchor. The procedure is repeated as each elevation of a building anchor is reached during the descent of the powered platform.

As the platform ascends, the procedure is reversed; that is, the stabilizer ties are removed as each elevation of a building anchor is reached. The removal of each stabilizer tie is assured since the platform is provided with stopping devices which will interrupt power to its hoist(s) in the event either stopping device contacts a stabilizer during the ascent of the platform.

Figure 2 of Appendix B illustrates another type of acceptable intermittent stabilization system which utilizes retaining pins as the quick connect-quick disconnect device in the stabilizer tie.

8. *Wire Rope Inspection*

The inspection of the suspension wire rope is important since the rope gradually loses strength during its useful life. The purpose of the inspection is to determine whether the wire rope has sufficient integrity to support a platform with the required design factor.

If there is any doubt concerning the condition of a wire rope or its ability to perform the required work, the rope should be replaced. The cost of wire rope replacement is quite small if compared to the cost in terms of human injuries, equipment down time and replacement.

No listing of critical inspection factors, which serve as a basis for wire rope replacement in the standard, can be a substitute for an experienced inspector of wire rope. The listing serves as a user's guide to the accepted standards by which ropes must be judged.

Rope life can be prolonged if preventive maintenance is performed regularly. Cutting off an appropriate length of rope at the end termination before the core degrades and valley breaks appear minimizes degradation at these sections.

9. *General Maintenance*

In meeting the general maintenance requirement in paragraph (h)(1) of the standard. the employer should undertake the prompt replacement of broken, worn and damaged parts, switch contacts, brushes, and short flexible conductors of electrical devices. The components of the electrical service system and traveling cables should be replaced when damaged or significantly abraded. In addition, gears, shafts, bearings, brakes and hoisting drums should be kept in proper alignment.

10. *Training*

In meeting the training requirement of paragraph (i)(1) of the standard, employers should use both on-the-job training and formal classroom training. The written work procedures used for this training should be obtained from the manufacturer, if possible, or prepared as necessary for the employee's information and use.

Employees who will operate powered platforms with intermittent stabilization systems should receive instruction in the specific ascent and descent procedures involving the assembly and disassembly of the stabilizer ties.

An acceptable training program should also include employee instruction in basic inspection procedures for the purpose of determining the need for repair and replacement of platform equipment. In addition, the program should cover the inspection, care and use of the personal fall protection equipment required in paragraph (j)(1) of the standard.

In addition, the training program should also include emergency action plan elements. OSHA brochure /3088 (Rev.) 1985. ''How to Prepare for Workplace Emergencies,'' details the basic steps needed to prepare to handle emergencies in the workplace.

Following the completion of a training program, the employee should be required to demonstrate competency in operating the equipment safely. Supplemental training of the employee should be provided by the employer, as necessary, if the equipment used or other working conditions should change.

An employee who is required to work with chemical products on a platform should receive training in proper cleaning procedures, and in the hazards, care and handling of these products. In addition, the employee should be supplied with the appropriate personal protective equipment, such as gloves and eye and face protection.

11. *Suspension and Securing of Powered Platforms (Equivalency)*

One acceptable method of demonstrating the equivalency of a method of suspending or securing a powered platform, as required in paragraphs (e)(2)(iii), (f)(3) and (f)(5)(i)(F), is to provide an engineering analysis by a registered professional engineer. The analysis should demonstrate that the proposed method will provide an equal or greater degree of safety for employees than any one of the methods specified in the standard.

Appendix B to Section 1910.66, Exhibits (Advisory)

[Added 1989]

The three drawings in Appendix B illustrate typical platform stabilization systems which are addressed in the standard. The drawings are to be used for reference purposes only, and do not illustrate all the mandatory requirements for each system.

Figure 1. Typical Self-Powered Platform--Continuous External or Indented Mullion Guide System

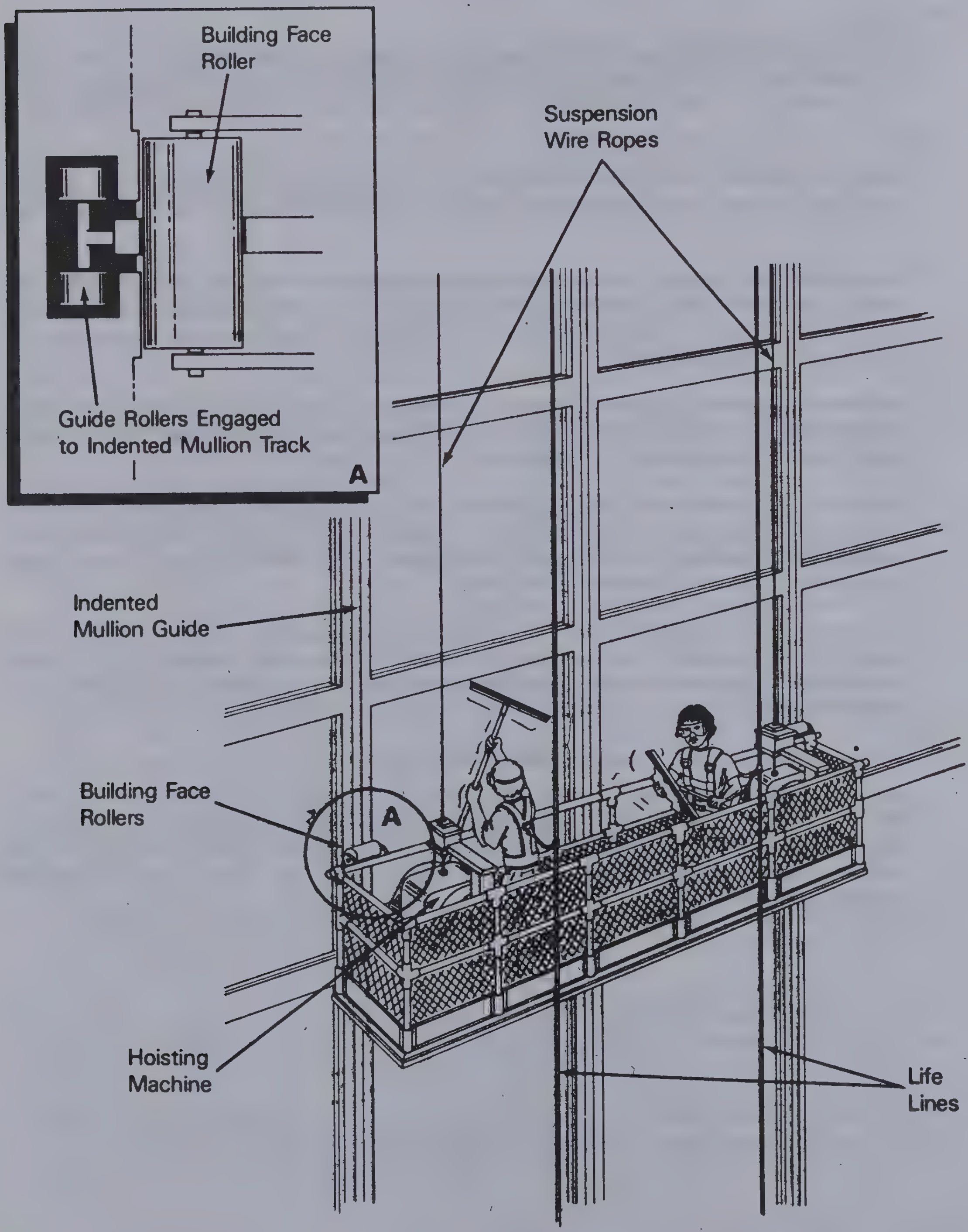


Figure 2. Typical Self-Powered Platform--Intermittent Tie-In System

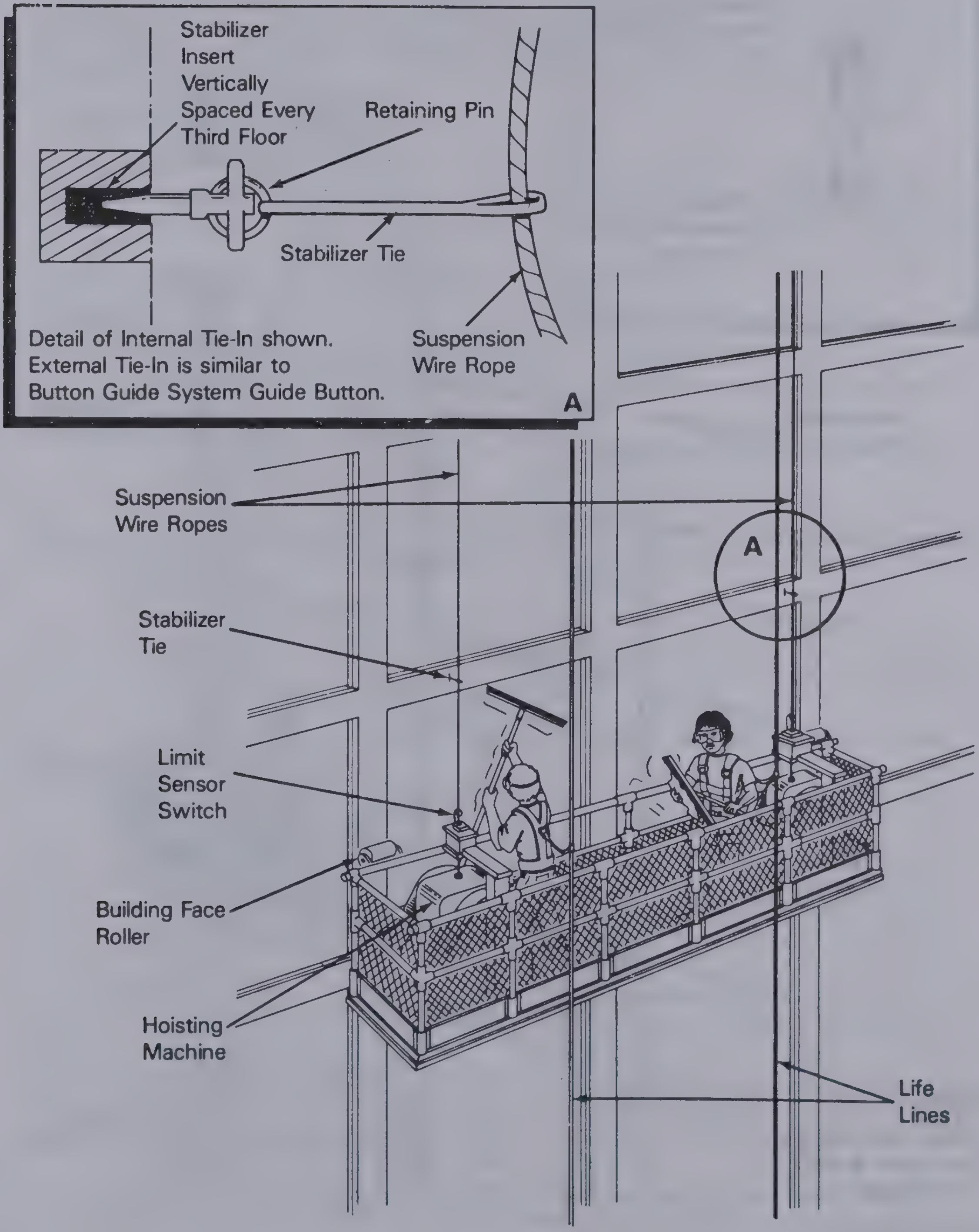
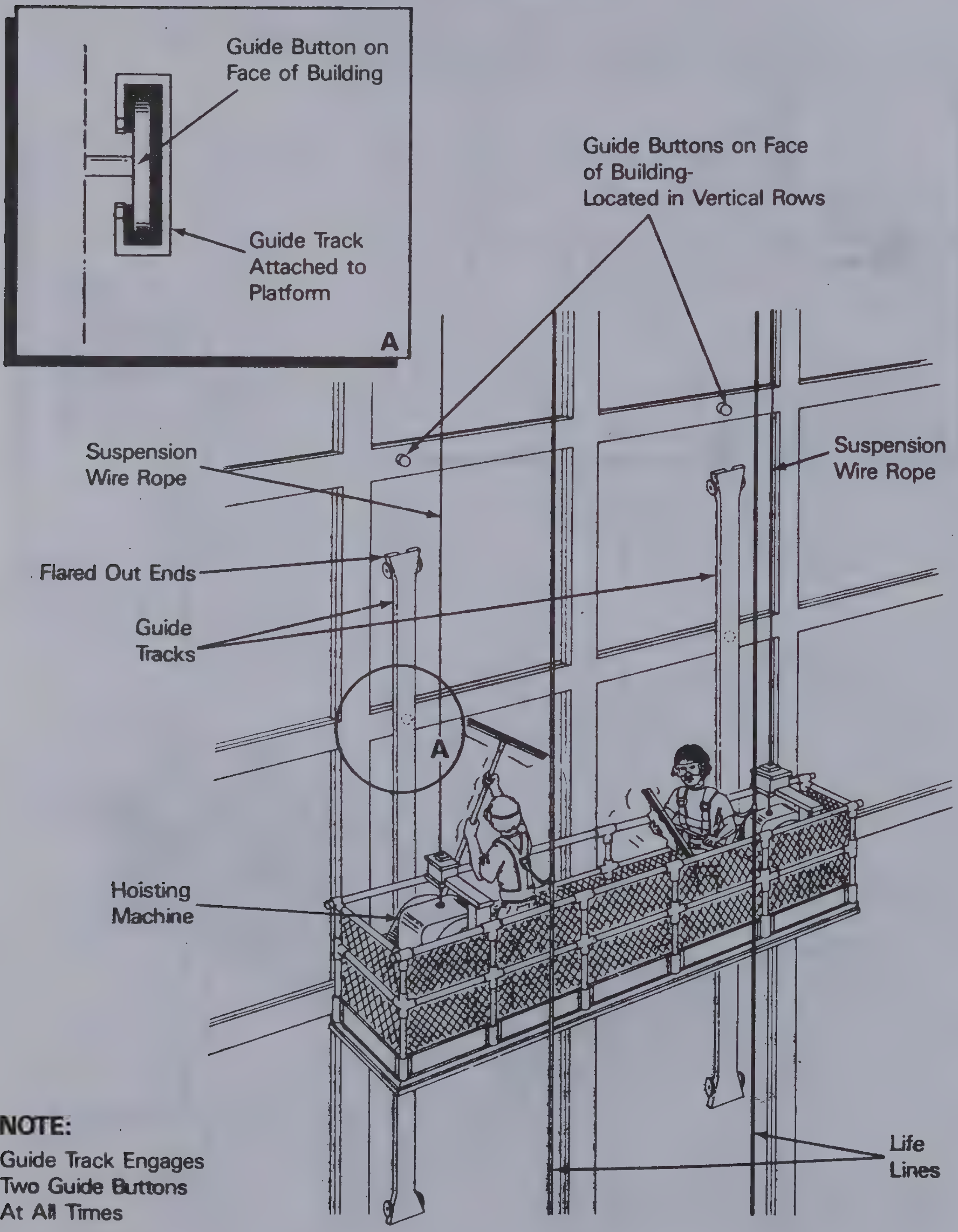

Stabilizer Insert Vertically Spaced Every Third Floor
Retaining Pin
Stabilizer Tie
Detail of Internal Tie-In shown. External Tie-In is similar to Button Guide System Guide Button.
Suspension Wire Rope
A
Suspension Wire Ropes
A
Stabilizer Tie
Limit Sensor Switch
Building Face Roller
Hoisting Machine
Life Lines

**Figure 3. Typical Self-Powered Platform--
Button Guide System**



NOTE:
Guide Track Engages
Two Guide Buttons
At All Times

BILLING CODE 4510-26-C

Appendix C to Section 1910.66. Personal Fall Arrest System (Section I-Mandatory; Sections II and III-Non-Mandatory)

[Added 1989]

Use of the Appendix

Section I of Appendix C sets out the mandatory criteria for personal fall arrest systems used by all employees using powered platforms, as required by paragraph (j)(1) of this standard. Section II sets out nonmandatory test procedures which may be used to determine compliance with applicable requirements contained in section I of this Appendix. Section III provides nonmandatory guidelines which are intended to assist employers in complying with these provisions.

I. Personal Fall Arrest Systems

(a) *Scope and Application*

This section establishes the application of and performance criteria for personal fall arrest systems which are required for use by all employees using powered platforms under paragraph 1910.66(j).

(b) Definitions can be found at the beginning of this chapter in this *manual*.

(c) *Design for System Components*

(1) Connectors shall be drop forged, pressed or formed steel, or made of equivalent materials.

(2) Connectors shall have a corrosion-resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.

(3) Lanyards and vertical lifelines which tie-off one employee shall have a minimum breaking strength of 5,000 pounds (22.2 kN).

(4) Self-retracting lifelines and lanyards which automatically limit free fall distance to two feet (0.61 m) or less shall have components capable of sustaining a minimum static tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(5) Self-retracting lifelines and lanyards which do not limit free fall distance to two feet (0.61 m) or less, ripstitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.

(6) Dee-rings and snap-hooks shall be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN).

(7) Dee-rings and snap-hooks shall be 100 percent proof-tested to a minimum tensile load of 3,600 pounds (16 kN) without cracking, breaking, or taking permanent deformation.

(8) Snap-hooks shall be sized to be compatible with the member to which they are connected so as to prevent unintentional disengagement of the snap-hook by depression of the snap-hook keeper by the connected member, or shall be a locking type snap-hook designed and used to prevent disengagement of the snap-hook by the contact of the snaphook keeper by the connected member.

(9) Horizontal lifelines, where used, shall be designed, and installed as part of a complete personal fall arrest system, which maintains a safety factor of at least two, under the supervision of a qualified person.

(10) Anchorages to which personal fall arrest equipment is attached shall be capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two, under the supervision of a qualified person.

(11) Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses, shall be made from synthetic fibers or wire rope.

(d) System Performance Criteria

(1) Personal fall arrest systems shall, when stopping a fall:

(i) Limit maximum arresting force on an employee to 900 pounds (4 kN) when used with a body belt;

(ii) Limit maximum arresting force on an employee to 1,800 pounds (8 kN) when used with a body harness;

(iii) Bring an employee to a complete stop and limit maximum deceleration distance an employee travels to 3.5 feet (1.07 m); AND

(iv) Shall have sufficient strength to withstand twice the potential impact energy of an employee free falling a distance of six feet (1.8 m), or the free fall distance permitted by the system, whichever is less.

(2)(i) When used by employees having a combined person and tool weight of less than 310 pounds (140 kg), personal fall arrest systems which meet the criteria and protocols contained in paragraphs (b), (c) and (d) in Section II of this Appendix shall be considered as complying with the provisions of paragraphs (d)(1)(i) through (d)(1)(iv) above.

(ii) When used by employees having a combined tool and body weight of 310 pounds (140 kg) or more, personal fall arrest systems which meet the criteria and protocols contained in paragraphs (b), (c) and (d) in Section II may be considered as complying with the provisions of paragraphs (d)(1)(i) through (d)(1)(iv) provided that the criteria and protocols are modified appropriately to provide proper protection for such heavier weights.

(e) Care and Use

(1) Snap-hooks, unless of a locking type designed and used to prevent disengagement from the following connections, shall not be engaged:

(i) Directly to webbing, rope or wire rope;

(ii) To each other;

(iii) To a dee-ring to which another snap-hook or other connector is attached;

(iv) To a horizontal lifeline; OR

(v) To any object which is incompatibly shaped or dimensioned in relation to the snap-hook such that the connected object could depress the snap-hook keeper a sufficient amount to release itself.

(2) Devices used to connect to a horizontal lifeline which may become a vertical lifeline shall be capable of locking in either direction on the lifeline.

(3) Personal fall arrest systems shall be rigged such that an employee can neither free fall more than six feet (1.8 m), nor contact any lower level.

(4) The attachment point of the body belt shall be located in the center of the wearer's back. The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.

(5) When vertical lifelines are used, each employee shall be provided with a separate lifeline.

(6) Personal fall arrest systems or components shall be used only for employee fall protection.

(7) Personal fall arrest systems or components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection unless inspected and determined by a competent person to be undamaged and suitable for reuse.

(8) The employer shall provide for prompt rescue of employees in the event of a fall or shall assure the self-rescue capability of employees.

(9) Before using a personal fall arrest system, and after any component or system is changed, employees shall be trained in accordance with the requirements of paragraph 1910.66(i)(1), in the safe use of the system.

(f) Inspections

Personal fall arrest systems shall be inspected prior to each use for mildew, wear, damage and other deterioration, and defective components shall be removed from service if their strength or function may be adversely affected.

II. Test Methods for Personal Fall Arrest Systems (Non-mandatory)

(a) General

Paragraphs (b), (c), (d) and (e), of this Section II set forth test procedures which may be used to determine compliance with the requirements in paragraph (d)(1)(i) through (d)(1)(iv) of Section I of this Appendix.

(b) General Conditions for all Tests in Section II

(1) Lifelines, lanyards and deceleration devices should be attached to an anchorage and connected to the body-belt or body harness in the same manner as they would be when used to protect employees.

(2) The anchorage should be rigid, and should not have a deflection greater than .04 inches (1 mm) when a force of 2,250 pounds (10 kN) is applied.

(3) The frequency response of the load measuring instrumentation should be 120 Hz.

(4) The test weight used in the strength and force tests should be a rigid, metal, cylindrical or torso-shaped object with a girth of 38 inches plus or minus four inches (96 cm plus or minus 10 cm).

(5) The lanyard or lifeline used to create the free fall distance should be supplied with the system, or in its absence, the least elastic lanyard or lifeline available to be used with the system.

(6) The test weight for each test should be hoisted to the required level and should be quickly released without having any appreciable motion imparted to it.

(7) The system's performance should be evaluated taking into account the range of environmental conditions for which it is designed to be used.

(8) Following the test, the system need not be capable of further operation.

(c) Strength Test

(1) During the testing of all systems, a test weight of 300 pounds plus or minus five pounds (135 kg plus or minus 2.5 kg) should be used. (See paragraph (b)(4), above.)

(2) The test consists of dropping the test weight once. A new unused system should be used for each test.

(3) For lanyard systems, the lanyard length should be six feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(4) For rope-grab-type deceleration systems, the length of the lifeline above the centerline of the grabbing mechanism to the lifeline's anchorage point should not exceed two feet (0.61 m).

(5) For lanyard systems, for systems with deceleration devices which do not automatically limit free fall distance to two feet (0.61 m) or less, and for systems with deceleration devices which have a connection distance in excess of one foot (0.3 m) (measured between the centerline of the lifeline and the attachment point to the body belt or harness), the test weight should be rigged to free fall a distance of 7.5 feet (2.3 m) from a point that is 1.5 feet (46 cm) above the anchorage point, to its hanging-location (six feet below the anchorage). The test weight should fall without interference, obstruction, or hitting the floor or ground during the test. In some cases a non-elastic wire lanyard of sufficient length may need to be added to the system (for test purposes) to create the necessary free fall distance.

(6) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to two feet (0.61 m) or less, the test weight should be rigged to free fall a distance of four feet (1.22 m).

(7) Any weight which detaches from the belt or harness should constitute failure for the strength test.

(d) Force test

(1) General

The test consists of dropping the respective test weight specified in (d)(2)(i) or (d)(3)(i) once. A new, unused system should be used for each test.

(2) For Lanyard Systems

(i) A test weight of 220 pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See paragraph (b)(4). above.)

(ii) Lanyard length should be six feet plus or minus two inches (1.83 m plus or minus 5 cm) as measured from the fixed anchorage to the attachment on the body belt or body harness.

(iii) The test weight should fall free from the anchorage level to its hanging location (a total of six feet (1.83 m) free fall distance) without interference, obstruction, or hitting the floor or ground during the test.

(3) For All Other Systems

(i) A test weight of 220 pounds plus or minus three pounds (100 kg plus or minus 1.6 kg) should be used. (See paragraph (b)(4), above.)

(ii) The free tall distance to be used in the test should be the maximum fall distance physically permitted by the system during normal use conditions, up to a maximum free fall distance for the test weight of six feet (1.83 m), except as follows:

(A) For deceleration systems which have a connection link or lanyard, the test weight should free fall a distance equal to the connection distance (measured between the centerline of the lifeline and the attachment point to the body belt or harness).

(B) For deceleration device systems with integral lifelines or lanyards which automatically limit free fall distance to two feet (0.61 m) or less, the test weight should free fall a distance equal to that permitted by the system in normal use. (For example, to test a system with a self-retracting lifeline or lanyard, the test weight should be supported and the system allowed to retract the lifeline or lanyard as it would in normal use. The test weight would then be released and the force and deceleration distance measured.)

(4) A system fails the force test if the recorded maximum arresting force exceeds 1,260 pounds (15.6 kN) when using a body belt, and/or exceeds 2,520 pounds (11.2 kN) when using a body harness.

(5) The maximum elongation and deceleration distance should be recorded during the force test.

(e) Deceleration Device Tests

(1) General

The device should be evaluated or tested under the environmental conditions, (such as rain, ice, grease, dirt, type of lifeline, etc.), for which the device Is designed.

(2) Rope-grab-type Deceleration Device

(i) Devices should be moved on a lifeline 1,000 times over the same length of line a distance of not less than one foot (30.5 cm), and the mechanism should lock each time.

(ii) Unless the device is permanently marked to indicate the type(s) of lifeline which must be used, several types (different diameters and different materials of lifelines should be used to test the device.

(3) Other Self-activating-type Deceleration Devices

The locking mechanisms of other self-activating-type deceleration devices designed for more than one arrest should lock each of 1,000 times as they would in normal service.

III. Additional Non-mandatory Guidelines for Personal Fall Arrest Systems

The following information constitutes additional guidelines for use in complying with requirements for a personal fall arrest system.

(a) Selection and Use Considerations

The kind of personal fall arrest system selected should match the particular work situation, and any possible free fall distance should be kept to a minimum. Consideration should be given to the particular work environment. For example, the presence of acids, dirt, moisture, oil, grease, etc., and their effect on the system, should be evaluated. Hot or cold environments may also have an adverse affect on the system. Wire rope should not be used where an electrical hazard is anticipated. As required by the standard, the employer must plan to have means available to promptly rescue an employee should a fall occur, since the suspended employee may not be able to reach a work level independently.

Where lanyards, connectors, and lifelines are subject to damage by work operations such as welding, chemical cleaning, and sandblasting, the component should be protected, or other securing systems should be used. The employer should fully evaluate the work conditions and environment (including seasonal weather changes) before selecting the appropriate personal fall protection system. Once in use, the system's effectiveness should be monitored. In some cases, a program for cleaning and maintenance of the system may be necessary.

(b) Testing Considerations

Before purchasing or putting into use a personal fall arrest system, an employer should obtain from the supplier information about the system based on its performance during testing so that the employer can know if the system meets this standard. Testing should be done using recognized test methods. Section II of this Appendix C contains test methods recognized for evaluating the performance of fall arrest systems. Not all systems may need to be individually tested; the performance of some systems may be based on data and calculations derived from testing of similar systems, provided that enough information is available to demonstrate similarity of function and design.

(c) Component Compatibility Considerations

Ideally, a personal fall arrest system is designed, tested, and supplied as a complete system. However, it is common practice for lanyards, connectors, lifelines, deceleration devices, body belts and body harnesses to be interchanged since some components wear out before others. The employer and employee should realize that not all components are interchangeable. For instance, a lanyard should not be connected between a body belt (or harness) and a deceleration device of the self-retracting type since this can result in additional free fall for which the system was not designed. Any substitution or change to a personal fall arrest system should be fully evaluated or tested by a competent person to determine that it meets the standard before the modified system is put in use.

(d) Employee Training Considerations

Thorough employee training in the selection and use of personal fall arrest systems is imperative. As stated in the standard, before, the equipment is used, employees must be trained in the safe use of the system. This should include the following:

Application limits;
Proper anchoring and tie-off techniques;
Estimation of free fall distance, including determination of deceleration distance, and total fall distance to prevent striking a lower level;
Methods of use; AND
Inspection and storage of the system.

Careless or improper use of the equipment can result in serious injury or death. Employers and employees should become familiar with the material in this Appendix, as well as manufacturer's recommendations, before a system is used. Of uppermost importance is the reduction in strength caused by certain tie-offs (such as using knots, tying around sharp edges, etc.) and maximum permitted free fall distance. Also, to be stressed are the importance of inspections prior to use, the limitations of the equipment, and unique conditions at the worksite which may be important in determining the type of system to use.

(e) Instruction Considerations

Employers should obtain comprehensive instructions from the supplier as to the system's proper use and application, including, where applicable:

(1) The force measured during the sample force test;

(2) The maximum elongation measured for lanyards during the force test;

(3) The deceleration distance measured for deceleration devices during the force test;

(4) Caution statements on critical use limitations;

(5) Application limits;

(6) Proper hook-up, anchoring and tie-off techniques, including the proper dee-ring or other attachment point to use on the body belt and harness for fall arrest;

(7) Proper climbing techniques;

(8) Methods of inspection, use, cleaning, and storage; AND

(9) Specific lifelines which may be used.

This information should be provided to employees during training.

(f) Inspection Considerations

As stated In the standard (Section 1, Paragraph (f)), personal fall arrest systems must be regularly inspected. Any component with any significant defect, such as cuts, tears, abrasions, mold, or undue stretching; alterations or additions which might, affect its efficiency; damage due to deterioration; contact with fire, acids, or other corrosives; distorted hooks or faulty hook springs; tongues unfitted t the shoulder of buckles; loose or damaged mountings; non-functioning parts; or wearing or internal deterioration in the ropes must be withdrawn from service immediately, and should be tagged or marked as unusable, or destroyed.

(g) Rescue Considerations

As required by the standard (Section 1. Paragraph (e)(8)), when personal fall arrest systems are used, the employer must assure that employees can be promptly rescued or can rescue themselves should a fall occur. The availability of rescue personnel, ladders or other rescue equipment should be evaluated. In some situations, equipment which allows employees to rescue themselves after the fall has been arrested may be desirable such as devices which have descent capability.

(h) Tie-off Considerations

(1) One of the most important aspects of personal fall protection systems is fully planning the system before it is put into use. Probably the most overlooked component is planning for suitable anchorage points. Such planning should ideally be done before the structure or building is constructed so that anchorage points can be incorporated during construction for use later for window cleaning or other building maintenance. If properly planned these anchorage points may be used during, construction, as well as afterwards.

(2) Employers and employees should at all times be aware that the strength of a personal fall arrest system is based on its being attached to an anchoring system which does not significantly reduce the strength of the system (such as a properly dimensioned eye-bolt/snap-hook anchorage). Therefore, if a means of attachment is used that will reduce the strength of the system, that component should be replaced by a stronger one, but one that will also maintain the appropriate maximum arrest force characteristics.

(3) Tie-off using a knot in a rope lanyard or lifeline (at any location) can reduce the lifeline or lanyard strength by 50 percent or more. Therefore, a stronger lanyard or lifeline should be used to compensate for the weakening effect of the knot, or the lanyard length should be reduced (or the tie-off location raised) to minimize free fall distance, or the lanyard or lifeline should be replaced by one which has an appropriately incorporated connector to eliminate the need for a knot.

(4) Tie-off of a rope lanyard or lifeline around an "H" or "I" beam or similar support can reduce its strength as much as 70 percent due to the cutting action of the beam edges. Therefore, use should be made of a webbing lanyard or wire core lifeline around the beam, or the lanyard or lifeline should be protected from the edge; or free fall distance should be greatly minimized.

(5) Tie-off where the line passes over or around rough or sharp surfaces reduces strength drastically. Such a tie-off should be avoided or an alternative tie-off rigging should be used. Such alternatives may include use of a snap-hook/dee ring connection, wire rope tie-off, an effective padding of the surfaces, or an abrasion- resistance strap around or over the problem surface.

(6) Horizontal lifelines may, depending on their geometry and angle of sag, be subjected to greater loads than the impact load imposed by an attached component. When the angle of horizontal lifeline sag is less than 30 degrees, the impact force imparted to the lifeline by an attached lanyard is greatly amplified. For example, with a sag angle of 15 degrees, the force amplification is about 2:1 and at 5 degrees sag, it is about 6:1. Depending on the angle of sag, and the line's elasticity, the strength of the horizontal lifeline and the anchorages to which it is attached should be increased a number of times over that of the lanyard. Extreme care should be taken in considering a horizontal lifeline for multiple tie-offs. The reason for this is that in multiple tie-offs to a horizontal lifeline, if one employee falls, the movement of the falling employee and the horizontal lifeline during arrest of the fall may cause other employees to also fall. Horizontal lifeline and anchorage strength should be increased for each additional employee to be tied-off. For these and other reasons, the design of systems using horizontal lifelines must only be done by qualified persons. Testing of installed lifelines and anchors prior to use is recommended.

(7) The strength of an eye-bolt is rated along the axis of the bolt and its strength is greatly reduced if the force is applied at an angle to this axis (in the direction of shear). Also, care should be exercised in selecting the proper diameter of the eye to avoid accidental disengagement of snap-hooks not designed to be compatible for the connection.

(8) Due to the significant reduction in the strength of the lifeline/lanyard (in some cases, as much as a 70 percent reduction), the sliding hitch knot should not be used for lifeline/lanyard connections except in emergency situations where no other available system is practical. The "one-and-one" sliding hitch knot should never be used because it is unreliable in stopping a fall. The "two-and-two" or "three-and-three" knot (preferable) may be used in emergency situations; however, care should be taken to limit free fall distance to a minimum because of reduced lifeline/lanyard strength.

(i) Vertical Lifeline Considerations

As required by the standard, each employee must have a separate lifeline when the lifeline is vertical. The reason for this is that in multiple tie-offs to a single lifeline, if one employee falls, the movement of the lifeline during the arrest of the fall may pull other employees' lanyards, causing them to fall as well.

(j) Snap-hook Considerations

Although not required by this standard for all connections, locking snap-hooks designed for connection to suitable objects (of sufficient strength) are highly recommended in lieu of the non-locking type. Locking snap-hooks incorporate a positive locking mechanism in addition to the spring loaded keeper, which will not allow the keeper to open under moderate pressure without someone first releasing the mechanism. Such a feature, properly designed effectively prevents roll-out from occurring.

As required by the standard (Section 1, paragraph (e)(1)) the following connections must be avoided (unless properly designed locking snap-hooks are used) because they are conditions which can result in roll-out when a nonlocking snap-hook is used:

- Direct connection of a snap-hook to a horizontal lifeline.
- Two (or more) snap-hooks connected to one dee-ring.
- Two snap-hooks connected to each other.
- A snap-hook connected back on its integral lanyard.

- A snap-hook connected to a webbing loop or webbing lanyard.
- Improper dimensions of the dee-ring, rebar, or other connection point in relation to the snap-hook dimensions which would allow the snap-hook keeper to be depressed by a turning motion of the snap-hook.

(k) *Free Fall Considerations*

The employer and employee should at all times be aware that a system's maximum arresting force is evaluated under normal use conditions established by the manufacturer, and in no case using a free fall distance in excess of six feet (1.8 m). A few extra feet of free fall can significantly increase the arresting force on the employee, possibly to the point of causing injury. Because of this, the free fall distance should be kept at a minimum, and, as required by the standard, in no case greater than six feet (1.8 m). To help assure this, the tie-off attachment point to the lifeline or anchor should be located at or above the connection point of the fall arrest equipment to belt or harness. (Since otherwise additional free fall distance is added to the length of the connecting means (i.e. lanyard)). Attaching to the working surface will often result in a free fall greater than six feet (1.8 m). For instance, if a six-foot (1.8 m) lanyard is used, the total free fall distance will be the distance from the working level to the body belt (or harness) attachment point plus the six feet (1.8 m) of lanyard length. Another important consideration is that the arresting force which the fall system must withstand also goes up with greater distances of free fall, possibly exceeding the strength of the system.

(l) *Elongation and Deceleration Distance Considerations*

Other factors involved in a proper tie-off are elongation and deceleration distance. During the arresting of a fall, a lanyard will experience a length of stretching or elongation, whereas activation of a deceleration device will result in a certain stopping distance. These distances should be available with the lanyard or device's instructions and must be added to the free fall distance to arrive at the total fall distance before an employee is fully stopped. The additional stopping distance may be very significant if the lanyard or deceleration device is attached near or at the end of a long lifeline, which may itself add considerable distance due to its own elongation. As required by the standard, sufficient distance to allow for all of these factors must also be maintained between the employee and obstructions below, to prevent an injury due to impact before the system fully arrests the fall. In addition, a minimum of 12 feet (3.7 m) of lifeline should be allowed below the securing point of a rope grab type deceleration device, and the end terminated to prevent the device from sliding off the life-line. Alternatively, the lifeline should extend to the ground or the next working level below. These measures are suggested to prevent the worker from inadvertently moving past the end of the lifeline and having the rope grab become disengaged from the lifeline.

(m) *Obstruction Considerations*

The location of the tie-off should also consider the hazard of obstructions in the potential fall path of the employee. Tie-offs which minimize the possibilities of exaggerated swinging should be considered. In addition, when a body belt is used, the employee's body will go through a horizontal position to a jack-knifed position during the arrest of all falls. Thus, obstructions which might interfere with this motion should be avoided or a severe injury could occur.

(n) *Other Considerations*

Because of the design of some personal fall arrest systems, additional considerations may be required for proper tie-off. For example, heavy deceleration devices of the self-retracting type should be secured overhead in order to avoid the weight of the device having to be supported by the employee. Also, if self-retracting equipment is connected to a horizontal lifeline, the sag in the lifeline should be minimized to prevent the device from sliding down the lifeline to a position which creates a swing hazard during fall arrest. In all cases, manufacturer's instructions should be followed.

Appendix D to Section 1910.66, Existing Installations (Mandatory)

[Added 1989]

Use of the Appendix

Appendix D sets out the mandatory building and equipment requirements for applicable permanent installations completed after August 27, 1971, and no later than July 23, 1990 which are exempt from the paragraphs (a), (b)(1), (b)(2), (c), (d), (e), and (f) of this standard. The requirements in Appendix D are essentially the same as unrevised building and equipment provisions which previously were designated as 29 CFR 1910.66 (a), (b), (c) and (d) and which were effective on August 27, 1971.

Note: All existing, installations subject to this Appendix shall also comply with paragraphs (g), (h), (i), (j) and Appendix C of the standard 29 CFR 1910.66.

(a) Definitions can be found at the beginning of this subpart in this *manual*.

(b) General Requirements

(1) Design Requirements

All powered platform installations for exterior building maintenance completed as of August 27,1971, but no later than [insert date, 180 days after the effective date], shall meet all of the design, construction and installation requirements of Part II and III of the ''American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance ANSI A120.1-1970'' and of this appendix. References shall be made to appropriate parts of ANSI A120.1-1970 for detail specifications for equipment and special installations.

(2) Limitation

The requirements of this appendix apply only to electric powered platforms. It is not the intent of this appendix to prohibit the use of other types of power. Installation of powered platforms using other types of power is permitted, provided such platforms have adequate protective devices for the type of power used, and otherwise provide for reasonable safety of life and limb to users of equipment and to others who may be exposed.

(3) Types of Powered Platforms

(i) For the purpose of applying this appendix, powered platforms are divided into two basic types, Type F and Type T.

(ii) Powered platforms designated as Type F shall meet all the requirements in Part II of ANSI A 120.1-1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance. A basic requirement of Type F equipment is that the work platform is suspended by at least four wire ropes and designed so that failure of any one wire rope will not substantially alter the normal position of the working platform. Another basic requirement of Type F equipment is that only one layer of hoisting rope is permitted on winding drums. Type F powered platforms may be either roof-powered or self-powered.

(iii) Powered platforms designated as Type T shall meet all the requirements in Part III of ANSI A120.1-1970 American National Standard Safely Requirements for Powered Platforms for Exterior Building Maintenance, except for section 28, Safety Belts and Life Lines. A basic requirement of Type T equipment is that the working platform is suspended by at least two wire ropes. Failure of one wire rope would not permit the working platform to fall to the ground, but would upset its normal position. Type T powered platforms may be either roof-powered or self-powered.

(iv) The requirements of this section apply to powered platforms with winding drum type hoisting machines. It is not the intent of this section to prohibit powered platforms using other types of hoisting machines such as, but not limited to, traction drum hoisting machines, air powered machines, hydraulic powered machines, and internal combustion machines. Installation of powered platforms with other types of hoisting machines is permitted, provided adequate protective devices are used, and provided reasonable safety of life and limb to users of the equipment and to others who may be exposed is assured.

(v) Both Type F and Type T powered platforms shall comply with the requirements of Appendix C of this standard.

(c) Type F Powered Platforms

(1) Roof Car, General

(i) A roof car shall be provided whenever it is necessary to move the working platform horizontally to working or storage positions.

(ii) The maximum rated speed at which a power traversed roof car may be moved in a horizontal direction shall be 50 feet per minute.

(2) Movement and Positioning of Roof Car

(i) Provision shall be made to protect against having the roof car leave the roof or enter roof areas not designed for travel.

(ii) The horizontal motion of the roof cars shall be positively controlled so as to insure proper movement and positioning of the roof car.

(iii) Roof car positioning devices shall be provided to insure that the working platform is placed and retained in proper position for vertical travel and during storage.

(iv) Mechanical stops shall be provided to prevent the traversing of the roof car beyond its normal limits of travel. Such stops shall be capable of withstanding a force equal to 100 percent of the inertial effect of the roof car in motion with traversing power applied.

(v)(a) The operating device of a power-operated roof car for traversing shall be located on the roof car, the working platform, or both and shall be of the continuous pressure weather-proof electric type. If more than one operating device is provided, they shall be so arranged that traversing is possible only from one operating device at a time.

(b) The operating device shall be so connected that it is not operable until:

(1) The working platform is located at its uppermost position of travel and is not in contact with the building face or fixed vertical guides in the face of the building; AND

(2) All protective devices and interlocks are in a position for traversing.

(3) Roof Car Stability

Roof car stability shall be determined by either paragraph (c)(3) (i) or (ii) of this Appendix, whichever is greater.

(i) The roof car shall be continuously stable, considering overturning moment as determined by 125 percent rated load, plus maximum dead load and the prescribed wind loading.

(ii) The roof car and its anchorages shall be capable of resisting accidental over-tensioning of the wire ropes suspending the working platform and this calculated value shall include the effect of one and one-half times the value. For this calculation, the simultaneous effect of one-half wind load shall be included, and the design stresses shall not exceed those referred to in paragraph (b)(1) of this Appendix.

(iii) If the load on the motors is at any time in excess of three times that required for lifting the working platform with its rated load the motor shall stall.

(4) Access to the Roof Car

Safe access to the roof car and from the roof car to the working platform shall be provided. If the access to the roof car at any point of its travel is not over the roof area or where otherwise necessary for safety, self-closing, self-locking gates shall be provided. Applicable provisions of the American National Standard Safety Requirements for Floor and Wall Openings, Railings and Toeboard, A12.1-1967, shall apply.

(5) Means for Maintenance, Repair and Storage

Means shall be provided to run the roof car away from the roof perimeter, where necessary, and to provide a safe area for maintenance, repairs and storage. Provisions shall be made to secure the machine in the stored position. For stored machines subject to wind forces, see special design and anchorage requirements for ''wind forces'' in Part 11, section 10.5.1.1 of ANSI A120.1-1970 American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(6) General Requirements for Working Platforms

The working platform shall be of girder or truss construction and shall be adequate to support its rated load under any position of loading, and comply with the provisions set forth in section 10 of ANSI A120.1-1970, American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.

(7) Load Rating Plate

Each working platform shall bear a manufacturer's load rating plate, conspicuously posted; stating the maximum permissible rated load. Load rating plates shall be made of noncorrosive material and shall have letters and figures stamped, etched or cast on the surface. The minimum height of the letters and figures shall be one-fourth inch.

(8) Minimum Size

The working platform shall have a minimum net width of 24 inches.

(9) Guardrails

Working platforms shall be furnished with permanent guard rails not less than 36 inches high, and not more than 42 inches high at the front (building side). At the rear, and on the sides, the rail shall not be less than 42 inches high. An intermediate guardrail shall be provided around the entire platform between the top guardrail and the toeboard.

(10) Toeboards

A four-inch toeboard shall be provided along all sides of the working platform.

(11) Open Spaces Between Guardrails and Toeboards

The spaces between the intermediate guardrail and platform toeboard on the building side of the working platform, and between the top guardrail and the toeboard, on other sides of the platform, shall be filled with metallic mesh or similar material that will reject a ball one inch in diameter. The installed mesh shall be capable of withstanding a load of 100 pounds applied horizontally over any area of 144 square inches. If the space between the platform and the building face does not exceed eight inches, and the platform is restrained by guides, the mesh may be omitted on the front side.

(12) Flooring

The platform flooring shall be of the nonskid type, and if of open construction, shall reject a 9/16-inch diameter ball, or be provided with a screen below the floor to reject a 9/16-inch diameter ball.

(13) Access Gates

Where access gates are provided, they shall be self-closing and self-locking.

(14) Operating Device for Vertical Movement of the Working Platform

(i) The normal operating device for the working platform shall be located on the working platform and shall be of the continuous pressure weatherproof electric type.

(ii) The operating device shall be operable only when all electrical protective devices and interlocks on the working platform are in position for normal service and, the roof car, if provided, is at an established operating point.

(15) Emergency Electric Operative Device

(i) In addition, on roof-powered platforms, an emergency electric operating device shall be provided near the hoisting machine for use in the event of failure of the normal operating device for the working platform, or failure of the traveling cable system. The emergency operating device shall be mounted in a locked compartment and shall have a legend mounted thereon reading: ''For Emergency Operation Only. Establish Communication With Personnel on Working Platform Before Use.''

(ii) A key for unlocking the compartment housing the emergency operating device shall be mounted in a break-glass receptacle located near the emergency operating device.

(16) Manual Cranking for Emergency Operation

Emergency operation of the main drive machine may be provided to allow manual cranking. This provision for manual operation shall be designed so that not more than two persons will be required to perform this operation. The access to this provision shall include a means to automatically make the machine inoperative electrically while under the emergency manual operation. The design shall be such that the emergency brake is operative at or below governor tripping speed during manual operation.

(17) Arrangement and Guarding of Hoisting Equipment

(i) Hoisting equipment shall consist of a power-driven drum or drum contained in the roof car (roof-powered platforms) or contained on the working platform (self-powered platform).

(ii) The hoisting equipment shall be power-operated in both up and down directions.

(iii) Guard or other protective devices shall be installed wherever rotating shafts or other mechanisms or gears may expose personnel to a hazard.

(iv) Friction devices or clutches shall not be used for connecting the main driving mechanism to the drum or drums. Belt or chain-driven machines are prohibited.

(18) Hoisting Motors

(i) Hoisting motors shall be electric and of weather-proof construction.

(ii) Hoisting motors shall be in conformance with applicable provisions of paragraph (c)(22) of this appendix, Electric Wiring and Equipment.

(iii) Hoisting motors shall be directly connected to the hoisting machinery. Motor couplings, if used, shall be of steel construction.

(19) Brakes

The hoisting machine(s) shall have two independent braking means, each designed to stop and hold the working platform with 125 percent of rated load.

(20) Hoisting Ropes and Rope Connections

(i) Working platforms shall be suspended by wire ropes of either 6 × 19 or 6 × 37 classification, preformed or nonpreformed.

(ii) [Reserved]

(iii) The minimum factor of safety shall be 10, and shall be calculated by the following formula:

$$F = S \times N/W$$

Where

S = Manufacturer's rated breaking strength of one rope.

N = Number of ropes under load.

W = Maximum static load on all ropes with the platform and its rated load at any point of its travel.

(iv) Hoisting ropes shall be sized to conform with the required factor of safety, but in no case shall the size be less than 5/16 inch diameter.

(v) Winding drums shall have at least three turns of rope remaining when the platform has landed at the lowest possible point of its travel.

(vi) The lengthening or repairing of wire rope by the joining of two or more lengths is prohibited.

(vii) The nondrum ends of the hoisting ropes shall be provided with individual shackle rods which will permit individual adjustment of rope lengths, if required.

(viii) More than two reverse bends in each rope is prohibited.

(21) Rope Tag Data

(i) A metal data tag shall be securely attached to one of the wire rope fastenings. This data tag shall bear the following wire rope data:

(a) The diameter in inches.

(b) Construction classification.

(c) Whether nonpreformed or preformed.

(d) The grade of material used.

(e) The manufacturer's rated breaking strength.

(f) Name of the manufacturer of the rope.

(g) The month and year the ropes were installed.

(22) Electrical Wiring and Equipment

(i) All electrical equipment and wiring shall conform to the requirements of the National Electrical Code, NFPA 70-1971; ANSI C1-1971 (Rev. of C1-1968), except as modified by ANSI A120.1-1970 ''American National Standard Safety Requirements for Powered Platforms for Exterior Building Maintenance.'' For detail design specifications for electrical equipment, see Part 2, ANSI A120.1-1970.

(ii) All motors and operation and control equipment shall be supplied from a single power source.

(iii) The power supply for the powered platform shall be an independent circuit supplied through a fused disconnect switch.

(iv) Electrical conductor parts of the power supply system shall be protected against accidental contact.

(v) Electrical grounding shall be provided.

(a) Provisions for electrical grounding shall be included with the power-supply system.

(b) Controller cabinets, motor frames, hoisting machines, the working platform, roof car and roof car track system, and noncurrent carrying parts of electrical equipment, where provided, shall be grounded.

(c) The controller, where used, shall be so designed and installed that a single ground or short circuit will not prevent both the normal and final stopping device from stopping the working platform.

(d) Means shall be provided on the roof car and working platform for grounding portable electric tools.

(e) The working platform shall be grounded through a grounding connection in a traveling cable. Electrically powered tools utilized on the working platform shall be grounded

(vi) Electrical receptacles located on the roof or other exterior location shall be of a weatherproof type and shall be located so as not to be subject to contact with water or accumulated snow. The receptacles shall be grounded and the electric cable shall include a grounding conductor. The receptacle and plug shall be a type designed to avoid hazard to persons inserting or withdrawing the plug. Provision shall be made to prevent application of cable strain directly to the plug and receptacle.

(vii) Electric runway conductor systems shall be of the type designed for use in exterior locations and shall be located so as not to be subject to contact with water or accumulated snow. The conductors, collectors, and disconnecting means shall conform to the same requirements as those for cranes and hoists in Article 610 of the National Electrical Code, NFPA 70-1971; ANSI C1-1971 (Rev. of C1-1968). A grounded conductor shall parallel the power conductors and be so connected that it cannot be opened by the disconnecting means. The system shall be designed to avoid hazard to persons in the area.

(viii) Electrical protective devices and interlocks of the weatherproof type shall be provided.

(ix) Where the installation includes a roof car, electric contact(s) shall be provided and so connected that the operating devices for the working platform shall be operative only when the roof car is located and mechanically retained at an established operating point.

(x) Where the powered platform includes a powered-operated roof car, the operating device for the roof car shall be inoperative when the roof car is mechanically retained at an established operating point.

(xi) An electric contact shall be provided and so connected that it will cause the down direction relay for vertical travel to open if the tension in the traveling cable exceeds safe limits.

(xii) An automatic overload device shall be provided to cut off the electrical power to the circuit in all hoisting motors for travel in the tip direction, should the load applied to the hoisting ropes at either end of the working platform exceed 125 percent of its normal tension with rated load, as shown on the manufacturer's data plate on the working platform.

(xiii) An automatic device shall be provided for each hoisting rope which will cut off the electrical power to the hoisting motor or motors in the down direction and apply the brakes if any hoisting rope becomes slack.

(xiv) Upper and lower directional limit devices shall be provided to prevent the travel of the working platform beyond the normal upper and lower limits of travel.

(xv) Operation of a directional limit device shall prevent further motion in the appropriate direction, if the normal limit of travel has been reached.

(xvi) Directional limit devices, if driven from the hoisting machine by chains, tapes, or cables, shall incorporate a device to disconnect the electric power from the hoisting machine and apply both the primary and secondary brakes in the event of failure of the driving means.

(xvii) Final terminal stopping devices of the working platform:

(a) Final terminal stopping devices for the working platform shall be provided as a secondary means of preventing the working platform from over-traveling at the terminals.

(b) The device shall be set to function as close to each terminal landing as practical, but in such a way that under normal operating conditions it will not function when the working platform is stopped by the normal terminal stopping device.

(c) Operation of the final terminal stopping device shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine, and applying both the primary and secondary brakes.

(d) The final terminal stopping device for the upper limit of travel shall be mounted so that it is operated directly by the motion of the working platform itself.

(xviii) Emergency stop switches shall be provided in or adjacent to each operating device.

(xix) Emergency stop switches shall:

- (a) Have red operating buttons or handles.
- (b) Be conspicuously and permanently marked "Stop."
- (c) Be the manually opened and manually closed type.
- (d) Be positively opened with the opening not solely dependent on springs.

(xx) The manual operation of an emergency stop switch associated with an operating device for the working platform shall open the potential relay for vertical travel, thereby disconnecting the electric power from the hoisting machine and applying both the primary and secondary brakes.

(xxi) The manual operation of the emergency stop switch associated with the operating device for a power-driven roof car shall cause the electrical power to the traverse machine to be interrupted, and the traverse machine brake to apply.

(23) Requirements for Emergency Communications

(i) Communication equipment shall be provided for each powered platform for use in an emergency.

(ii) Two-way communication shall be established between personnel on the roof and personnel on the stalled working platform before any emergency operation of the working platform is undertaken by personnel on the roof.

(iii) The equipment shall permit two-way voice communication between the working platform; AND

- (a) Designated personnel continuously available while the powered platform is in use; AND
- (b) Designated personnel on roof-powered platforms, undertaking emergency operation of the working platform by means of the emergency operating device located near the hoisting machine.

(iv) The emergency communication equipment shall be one of the following types:

- (a) Telephone connected to the central telephone exchange system; OR
- (b) Telephones on a limited system or an approved two-way radio system, provided designated personnel are available to receive a message during the time the powered platform is in use.

(d) Type T Powered Platforms.

(1) Roof Car

The requirements of paragraphs (c)(1) through (c)(5) of this Appendix shall apply to Type T powered platforms.

(2) Working Platform

The requirements of paragraphs (c)(6) through (c)(16) of this Appendix apply to Type T powered platforms.

(i) The working platform shall be suspended by at least two wire ropes.

(ii) The maximum rated speed at which the working platform of self-powered platforms may be moved in a vertical direction shall not exceed 35 feet per minute.

(3) Hoisting Equipment

The requirements of paragraphs (c) (17) and (18) of this Appendix shall apply to Type T powered platforms.

T5

(4) Brakes

Brakes requirements of paragraph (c)(19) of this Appendix shall apply.

(5) Hoisting Ropes and Rope Connections

(i) Paragraphs (c)(20) (i) through (vi) and (viii) of this Appendix shall apply to Type T powered platforms.

(ii) Adjustable shackle rods in subparagraph (c)(20)(vii) of this Appendix shall apply to Type T powered platforms, if the working platform is suspended by more than two wire ropes.

(6) Electrical Wiring and Equipment

(i) The requirements of paragraphs (c)(22) (i) through (vi) of this Appendix shall apply to Type T powered platforms. ''Circuit protection limitation,'' ''powered platform electrical service system,'' all operating services and control equipment shall comply with the specifications contained in Part 2, section 26, ANSI A120.1-1970.

(ii) For electrical protective devices the requirements of paragraphs (c)(22) (i) through (viii) of this Appendix shall apply to Type T powered platforms. Requirements for the ''circuit potential limitation'' shall be in accordance with specifications contained in Part 2, section 26, of ANSI A120.1-1970.

(7) Emergency Communications

All the requirements of paragraph (c)(23) of this Appendix shall apply to Type T powered platforms.

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T5

OVERVIEW: SUBPART G

OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

This section contains provisions for employee protection from environmental hazards, and includes requirements for ventilation, hearing protection, and radiation protection.

Ventilation requirements (1910.94) outline the conditions where local exhaust ventilation is necessary to reduce harmful concentrations of dusts and fumes. Operations affected by the ventilation requirements include abrasive blast cleaning; grinding, polishing and buffing of ferrous and nonferrous metals; spray finishing; and open surface tanks. Open surface tanks are those used for the immersion of materials for cleaning or surface finishing, and include washing; electroplating; anodizing, pickling; quenching; dying; dipping; tanning; dressing; bleaching; degreasing; alkaline cleaning; stripping; rinsing; and digesting operations.

The standard for occupational noise exposure (1910.95) applies to any workplace where noise exposures exceed the levels outlined on page G-08. The standard contains specifications for permissible noise exposures and methods for calculating daily exposure levels. Feasible work practice and engineering controls are required to reduce noise levels. A hearing conversation program is required when employees are exposed to average noise levels of 85 dB or more during an eight-hour workday, except in oil and gas well drilling operations, which are exempt.

Standards on ionizing and nonionizing radiation (1910.96-.97) apply to all workplace full-body and partial-body radiation exposures, including those from X-ray machines; particle accelerators; naturally-occurring radioactive materials such as radium; TV and radio stations; radar equipment; radio navigation; radio-frequency heat sealers and heaters; microwave antennae; communications; and exposures for industrial and scientific purposes (excluding exposure of medical patients). Exposure to radioactive source materials, special nuclear material, and radioactive by-product materials are regulated by the Nuclear Regulatory Commission, not OSHA.

Specific sections covered in the checklist are:

Std. No. **Page No.**

1910.94 **Ventilation** . . . . (G-01)
- **(a) Abrasive blasting** . . . . (G-01)
- **(b) Grinding, polishing and buffing** . . . . (G-02)
- **(c) Spray-finishing operations** . . . . (G-03)
- **(d) Open surface tanks** . . . . (G-05)

1910.95 **Occupational noise exposure** . . . . (G-08)
- **(c) Hearing conservation program** . . . . (G-08a)
- **(d) Monitoring** . . . . (G-08a)
- **(g) Audiometric testing program** . . . . (G-08b)
- **(i) Hearing protectors** . . . . (G-08c)
- **(k) Training program** . . . . (G-08c)
- **(m) Recordkeeping** . . . . (G-08d)

1910.96 **Ionizing radiation** . . . . (G-09)
- **(b) Restricted areas** . . . . (G-09)
- **(c) Airborne radioactive material** . . . . (G-09)
- **(d) Personal monitoring** . . . . (G-09)

(e) Caution signs, labels, signals .... (G-10)
(f) Evacuation warning signal .... (G-10)
(i) Instruction of personnel .... (G-11)
(j) Storage of radioactive materials .... (G-11)
(k) Waste disposal .... (G-11)
(l) Notification of incidents .... (G-11)
(m,n) Reports, recordkeeping .... (G-12)
1910.97 Nonionizing radiation .... (G-13)

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DEFINITIONS — SUBPART G

Definitions applicable to 1910.94, Ventilation:

Abrasive. A solid substance used in an abrasive blasting operation.

Abrasive blasting. The forcible application of an abrasive to a surface by pneumatic pressure, hydraulic pressure, or centrifugal force.

Abrasive-blasting respirator. A continuous flow air-line respirator that covers the wearer's head, neck, and shoulders to protect from rebounding abrasive.

Abrasive cutting-off wheels. Organic-bonded wheels used for cutting, cutting off, grooving, slotting, coping, and jointing. The wheels may be "solid," "steel centered," or "inserted tooth" type.

Belts. All power-driven, flexible, coated bands used for grinding, polishing, or buffing purposes.

Blast cleaning barrel. A complete enclosure which rotates on an axis, or which has an internal moving tread to tumble the parts, in order to expose various surfaces of the parts to the action of an automatic blast spray.

Blast cleaning room. A complete enclosure in which blasting operations are performed and in which the operator operates the blasting nozzle and directs the flow of the abrasive material.

Blasting cabinet. An enclosure where the operator stands outside and operates the blasting nozzle through an opening or openings in the enclosure.

Branch pipe. The part of an exhaust system piping that is connected directly to the hood or enclosure.

Clean air. Air of such purity that it will not cause harm or discomfort to an individual if it is inhaled for extended periods of time.

Cradle. A movable fixture, upon which the part to be ground or polished is placed.

Disc wheels. All power-driven rotatable discs faced with abrasive materials, artificial or natural, and used for grinding or polishing on the side of the assembled disc.

Dust collector. A device or combination of devices for separating dust from the air handled by an exhaust ventilation system.

Entry loss. The loss in static pressure caused by air flowing into a duct or hood.

Exhaust system. A system consisting of branch pipes connected to hoods or enclosures, one or more header pipes, an exhaust fan, means for separating solid contaminants from the air flowing in the system, and a discharge stack to outside.

Exhaust ventilation system. A system for removing contaminated air from a space, comprising two or more of the following elements (a) enclosure or hood, (b) duct work, (c) dust collecting equipment, (d) exhauster, and (e) discharge stack.

Grinding wheels. All power-driven rotatable grinding or abrasive wheels, except disc wheels as defined above, consisting of abrasive particles held together by artificial or natural bonds and used for peripheral grinding.

Header pipe (main pipe). A pipe into which one or more branch pipes enter and which connects such branch pipes to the remainder of the exhaust system.

Hoods and enclosures. The partial or complete enclosure around the wheel or disc through which air enters an exhaust system during operation.

Horizontal double-spindle disc grinder. A grinding machine carrying two power-driven, rotatable, coaxial, horizontal spindles upon the inside ends of which are mounted abrasive disc wheels used for grinding two surfaces simultaneously.

Horizontal single-spindle disc grinder. A grinding machine carrying an abrasive disc wheel upon one or both ends of a power-driven, rotatable single horizontal spindle.

Minimum maintained velocity. The velocity of air movement which must be maintained in order to meet minimum specified requirements for health and safety.

Particulate-filter respirator. An air purifying respirator, commonly referred to as a dust or a fume respirator, which removes most of the dust or fume from the air passing through the device.

Polishing and buffing wheels. All power-driven rotatable wheels composed all or in part of textile fabrics, wood, felt, leather, paper, and may be coated with abrasives on the periphery of the wheel for purposes of polishing, buffing, and light grinding.

Portable grinder. Any power-driven rotatable grinding, polishing, or buffing wheel mounted in such manner that it may be manually manipulated.

Respirable dust. Airborne dust in sizes capable of passing through the upper respiratory system to reach the lower lung passages.

Rotary blast cleaning table. An enclosure where the pieces to be cleaned are positioned on a rotating table and are passed automatically through a series of blast sprays.

Scratch brush wheels. All power-driven rotatable wheels made from wire or bristles, and used for scratch cleaning and brushing purposes.

Spray booth. Spray booths are defined and described in § 1910.107(a). (See sections 103, 104, and 105 of the Standard for Spray Finishing Using Flammable and Combustible Materials, NFPA No. 33-1969).

Spray-finishing operations. Methods wherein organic or inorganic materials are utilized in dispersed form for deposit on surfaces to be coated, treated, or cleaned. This may involve either automatic, manual, or electrostatic deposition but does not include metal spraying or metallizing, dipping, flow coating, roller coating, tumbling, centrifuging, or spray washing and degreasing as conducted in self-contained washing and degreasing machines or systems.

Spray room. A room in which spray-finishing operations not conducted in a spray booth are performed separately from other areas.

Swing-frame grinder. Any power-driven rotatable grinding, polishing, or buffing wheel mounted in such a manner that the wheel with its supporting framework can be manipulated over stationary objects.

Velocity pressure (vp). The kinetic pressure in the direction of flow necessary to cause a fluid at rest to flow at a given velocity.

Vertical spindle disc grinder. A grinding machine having a vertical, rotatable power-driven spindle carrying a horizontal abrasive disc wheel.

Note: Definitions applicable to 1910.95. Occupational Noise Exposure, may be found in Appendix 1, page G(a)-02-G, under the red tab.

Definitions applicable to 1910.96, Ionizing Radiation, and 1910.97, Nonionizing Radiation:

Air dose. A dose measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dosage rate.

Dose. The quantity of ionizing radiation absorbed, per unit of mass, by the body or by any portion of the body.

Electromagnetic radiation. That portion of the spectrum commonly defined as the radio frequency region, including the microwave frequency region.

Partial body irradiation. Occurs when part of the body is exposed to incident electromagnetic energy.

Rad. A measure of the dose of any ionizing radiation to body tissues in terms of the energy absorbed per unit mass of the tissue. One rad is the dose corresponding to the absorption of 100 ergs per gram of tissue (1 millirad (mrad) = 0.001 rad).

Radiation. Energy, including alpha rays, beta rays, gamma rays, X-rays, neutrons, high-speed electrons, high-speed protons, and other atomic particles; but not including sound or radio waves, or visible, infrared, or ultraviolet light.

Radiation protection guide. Radiation level which should not be exceeded without careful consideration of the reasons for doing so.

Radioactive material. Any material which emits, by spontaneous nuclear disintegration, corpuscular or electromagnetic emanations.

Rem. A measure of the dose of any ionizing radiation to body tissue in terms of its estimated biological effect relative to a dose of 1 roentgen (r) of X-rays (1 millirem (mrem) = 0.001 rem).

Restricted area. Any area to which access is controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.

Symbol. The overall design, shape, and coloring of the rf radiation sign shown in figure G-11.

Unrestricted area. Any area to which access is not controlled by the employer for purposes of protection of individuals from exposure to radiation or radioactive materials.

Whole body irradiation. Occurs when the entire body is exposed to the incident electromagnetic energy or in which the cross section of the body is smaller than the cross section of the incident radiation beam.

1910.94 – VENTILATION
(a) Abrasive Blasting.

	YES	NO
Is the concentration of respirable dust or fume in the breathing zone of the abrasive-blasting operator or any other worker kept below the levels specified in Sec. 1910.1000? (2)(ii)		
If flammable or explosive dust mixtures are present, are the following items complied with: (2)(iii)		
Does construction of the equipment, including the exhaust system and all electric wiring, conform to the requirements of ANSI Z33.1-1961?		
Does the installation also conform with the National Electrical Code of 1971?		
Is the blast nozzle bonded and grounded?		
Are the blast enclosure, ducts, and dust collector constructed with loose panels or explosion venting areas?		
Are those loose panels or explosion vents located on sides away from occupied areas?		
Do the installations of loose panels or explosion vents follow the Explosion Venting Guide – NFPA 68-1954?		
Are blast-cleaning enclosures exhaust ventilated in such a way that a continuous inward flow of air will be maintained at all openings in the enclosure during the blasting operations? (3)(i)		
Are all air inlets and access openings baffled or so arranged that by the combination of inward air flow and baffling the escape of abrasive or dust into an adjacent work area is minimized? (3)(i)(a)		
Is the rate of exhaust sufficient to provide prompt clearance of the dust-laden air within the enclosure after the blasting ceases? (3)(i)(b)		
After the blast is turned off, is the exhaust system run for a sufficient period of time to remove the dusty air within the enclosure, before the enclosure is opened? (3)(i)(c)		
Where hard deep-cutting abrasives are used, is safety glass protected by screening used in observation windows? (3)(i)(d)		
Are slit abrasive-resistant baffles installed in multiple sets at all small access openings where dust might escape? (3)(i)(e)		
Are these baffles inspected regularly and replaced when needed? (3)(i)(e)		
Are doors flanged and tight when closed? (3)(i)(e)		
Are doors on blast-cleaning rooms operable from both inside and outside? (3)(i)(e)		
NOTE: If there is a small operator access door, the large work access door may be closed or opened from the outside only. (3)(i)(e)		
Does the construction, installation, inspection, and maintenance of the exhaust systems conform to ANSI Z9.2-1960 and ANSI Z33.1-1961? (4)(i)		
Are repairs made as soon as possible when dust leaks are noted? (4)(i)(a)		

1910.94 – VENTILATION
(a) Abrasive Blasting

	YES	NO
Was the static pressure drop at the exhaust ducts leading from the equipment checked when the installation was completed, and periodically thereafter to assure continued satisfactory operation? (4)(i)(b)		
Whenever an appreciable change in the pressure drop indicates a partial blockage, is the system cleaned and returned to normal operating condition? (4)(i)(b)		
Is an abrasive separator provided to remove the fines from the spent abrasive, where the abrasive is recirculated? (4)(ii)		
Is the air exhausted from blast-cleaning equipment discharged through dust collecting equipment? (4)(iii)		
Are the dust collectors set up so that the accumulated dust can be emptied and removed without contaminating other working areas? (4)(iii)		
Does the respiratory protective equipment used for the protection of personnel against dusts comply with the Bureau of Mines, U.S. Department of Interior, regulations? (5)(i)		
Are all abrasive-blasting operators required to wear abrasive-blasting respirators when working inside of blast-cleaning rooms, or when using silica sand in manual blasting operations where the nozzle and blast are not physically separated from the operator in an exhaust-ventilated enclosure, or (5)(ii)		
Where the concentrations of toxic dust may exceed the limits set forth in 1910.1000 and the nozzle and blast are not physically separated from the operator in an exhaust-ventilated enclosure? (5)(ii)		
Where dust-filter respirators are used for short, intermittent or occasional dust exposures, are the respirators approved by the Bureau of Mines? (5)(iii)(a)		
Are dust-filter respirators prohibited for continuous protection where silica sand is used as the blasting abrasive, or toxic materials are blasted? (5)(iii)(b)		
Is a respiratory protection program as described in 1910.134(a) and (b) established? (5)(iv)		
Are operators equipped with heavy canvas or leather gloves and aprons to protect them from the impact of abrasives? (5)(v)		
Are safety shoes worn to protect against foot injury where heavy pieces of work are handled? (5)(v)		
Do these safety shoes conform to the requirements of ANSI Z41.1-1967? (5)(v)(a)		
Does all the equipment for protection of the eyes and face conform to the requirements of 1910.133? (5)(v)(b)		
Is the breathing air for abrasive-blasting respirators free of harmful quantities of dust, mists, or noxious gases? (6)		
Does the air supply meet the standards as set forth in ANSI Z9.2-1960? (6)		
If air from the regular compressed air line of the plant is used for the abrasive-blasting respirator, are the following three items followed: (6)		
Is there a trap and carbon filter installed and regularly maintained to remove oil, water, scale and odor? (6)(i)		

1910.94 – VENTILATION
(a) Abrasive Blasting

	YES	NO
Is there a pressure reducing diaphragm or valve installed to reduce the pressure down to requirements of the particular type of abrasive-blasting respirator? **(6)(ii)**		
Is an automatic control provided to either sound an alarm or shut down the compressor in case of overheating? **(6)(iii)**		
Are accumulations of dust on the floor or on ledges outside of an abrasive-blasting enclosure removed and cleaned up properly? **(7)**		
Are aisles and walkways kept clear of steel shot or similar abrasive which may create a slipping hazard? **(7)**		
Scope. **(8)**		
The following items concerning 1910.94(b) prescribe the use of exhaust hood enclosures and systems, in removing dust, dirt, fumes, and gases generated through the grinding, polishing or buffing of ferrous and nonferrous metals. **(8)(a)**		
(b) Grinding, polishing, and buffing operations.		
Are suitable hood or enclosures provided that are connected to exhaust systems for every operation involved with dry grinding, dry polishing, or buffing? **(2)(i)**		
Are these exhaust systems operated continuously whenever such operations are in progress? **(2)(ii)**		
Are hoods connected to the exhaust systems so designed, located and placed so that dirt particles fall or are projected into the hoods in the direction of the air flow? **(3)(i)**		
Are all wheels, discs, straps, or belts operated in such a manner and in such direction so as to prevent dust and dirt particles being thrown into the operator's breathing zone? **(3)(i)**		
Are the minimum exhaust volumes, as shown in Table G-4*, provided for all grinding wheels on floor stands, pedestals, benches, and special-purpose grinding machines and abrasive cutting-off wheels? **(3)(ii)**		
For any wheel wider than wheel diameters shown in Table G-4*, is the exhaust volume determined by the formula provided below Table G-4*? **(3)(ii)**		
Are the minimum exhaust volumes as shown in Table G-5*, provided for all scratch-brush wheels and all buffing and polishing wheels mounted on floor stands, pedestals, benches or special-purpose machines? **(3)(iii)**		
Are hoods provided for grinding wheels or discs for horizontal single-spindle disc grinders connected to branch pipes having exhaust volumes as shown in Table G-6*? **(3)(iv)**		
Are hoods for grinding wheels or discs for horizontal double-spindle disc grinders provided, and are they connected to one or more branch pipes having exhaust volumes as shown in Table G-7*? **(3)(v)**		
Are hoods provided for grinding wheels or discs for vertical single-spindle disc grinders, and are the hoods connected to one or more branch pipes having exhaust volumes as shown in Table G-8*? **(3)(vi)**		
Are hoods provided for grinding and polishing belts and are they connected to branch pipes having exhaust volumes as shown in Table G-9*? **(3)(vii)**		

*See Self-Inspection Appendix

1910.94 – VENTILATION
(b) Grinding, polishing, and buffing operations

	YES	NO
Where cradles and swing-frame grinders are used, is there a minimum average air velocity of 150 feet per minute maintained over the entire opening of the enclosure? **(3)(viii)**		
Is Fig. G-3* used as a guide in applying an exhaust enclosure? **(3)(viii)**		
Where the work is outside the hood, are the air volumes substantially in accordance with ANSI Z9.2-1960? **(3)(ix)**		
Are exhaust systems for grinding, polishing, and buffing operations designed in accordance with ANSI Z9.2-1960? **(4)(i)**		
Are exhaust systems for grinding, polishing, and buffing tested in the manner described in ANSI Z9.2-1960? **(4)(ii)**		
Are suitable dust collectors provided for all exhaust systems? **(4)(iii)**		
Are hoods for grinding and abrasive cutting-off wheels of a structural strength as required by ANSI B7.1-1970? **(5)(i)**		
Are these hoods developed and adaptable to each particular machine, and are these hoods located as close as possible to the operation? **(5)(i)**		
Are exhaust hoods for floor stands, pedestals, and bench grinders designed in accordance with Fig. G-2*? **(5)(ii)**		
Is the adjustable tongue kept in working order and adjusted within one-fourth-inch of the wheel periphery at all times? **(5)(ii)**		
Are exhaust booths for swing-frame grinders designed as indicated in Fig. G-3*? **(5)(iii)**		
Are portable grinding operations conducted within a partial enclosure? **(5)(iv)**		
Is the opening in the enclosure no larger than that which is actually required? **(5)(iv)**		
Is there an average face velocity of not less than 200 feet per minute maintained at the opening? **(5)(iv)**		
Are hoods for polishing and buffing and scratch-brush wheels constructed in accordance with Fig. G-4*? **(5)(v)**		
For cradle grinding and polishing operations, is the enclosure designed as shown in Fig. G-5*? **(5)(vi)**		
Is the operator's position outside the working face of the opening of the enclosure? **(5)(vi)**		
Is the face opening of the enclosure no greater than that actually required? **(5)(vi)**		
Is there an average air velocity into the working face of at least 150 feet per minute maintained? **(5)(vi)**		
Are hoods for horizontal single-spindle disc grinders constructed as shown in Fig. G-6*? **(5)(vii)**		
Is the opening on the side of the disc no larger than that required for the grinding operation? **(5)(vii)**		
Is this opening never less than twice the area of the branch outlet? **(5)(vii)**		
For horizontal double-spindle disc grinders, are the hoods encircling the wheels similar to that in Fig. G-7*? **(5)(viii)**		
Are the openings for passing the work into the grinding chamber kept as small as possible? **(5)(viii)**		

Are these openings never less than twice the area of the branch outlets? (5)(viii)

Are vertical-spindle disc grinders encircled with a hood so constructed that the heavy dust is drawn off a surface of the disc and the lighter dust exhausted through the continuous slot at the top of the hood, as shown in Fig G-1*? (5)(ix)

For grinding and polishing belts, are the hoods constructed as close to the operation as possible? (5)(x)

Are grinding and polishing belt hoods designed as shown in Fig. G-8*? (5)(x)

(c) Spray-finishing operations.

Definition of spray-finishing operations. (1)

> Spray-finishing operations are employment of methods wherein organic or inorganic materials are utilized in dispersed form for deposit on surfaces to be coated, treated, or cleaned. Such methods of deposit may involve either automatic, manual, or electrostatic deposition but do not include metal spraying or metallizing, dipping, flow coating, roller coating, tumbling, centrifuging, or spray washing and degreasing as conducted in self-contained washing and degreasing machines or systems.

The scope of 1910.94(c) requires that spray booths or spray rooms are to be used to enclose or confine all spray-finishing operations. This scope does not apply to the spraying of the exteriors of buildings, fixed tanks, or similar structures, nor to small portable spraying apparatus not used repeatedly in the same location. (1)

Are spray booths or spray rooms used to enclose or confine all operations? (2)

Are spray-finishing operations located as provided in sections 201 through 206 of NFPA Standard No. 33-1969? (2)

Are spray booths designed and constructed in accordance with sections 301-304 and 306-310 of NFPA Standard No. 33-1969, and ANSI Z9.2-1960? (3)(i)

Are lights, motors, electrical equipment, and other sources of ignition in conformance with the requirements of section 310 and chapter 4 of NFPA Standard No. 33-1969? (3)(i)

Is the use of combustible material prohibited in the construction of a spray booth and supply or exhaust duct connected to it? (3)(i)

Are unobstructed walkways at least 6½ feet high and maintained clear of obstruction from any work location to a booth exit or open booth front? (3)(ii)

In booths where the open front is the only exit, is such exit at least 3 feet wide? (3)(ii)

In booths having multiple exits, and where the work location is 25 feet or less from the exit, are the exits at least 2 feet wide? (3)(ii)

Are doors on booth exits such that they open outward from the booth? (3)(ii)

Do baffles, distribution plates, and dry-type overspray collectors conform to the requirements of sections 304 and 305 of NFPA Standard No. 33-1969? (3)(iii)

*See Self-Inspection Appendix

Are overspray filters installed and maintained in accordance with the requirements of section 305 of NFPA Standard No. 33-1969? (3)(iii)

Are these overspray filters in a location easily accessible for inspection, cleaning, or replacement? (3)(iii)

NOTE: It is permissible to operate the booth without the filters in place, where other effective means are installed which will result in design air distribution across the booth cross-section.

Where water chamber enclosures for wet or water-wash spray booths are made of steel, is the steel of 18 gauge or heavier, and is it adequately protected against corrosion? (3)(iv)

Are collecting tanks made of welded steel construction or other suitable non-combustible material? (3)(v)

If pits are used as collecting tanks, are they of concrete, masonry, or other material having similar properties? (3)(v)

Are collecting tanks provided with weirs, skimmer plates, or screens to prevent sludge and floating paint from entering the pump suction box? (3)(v)

Are means provided on collecting tanks for automatically maintaining the proper water level? (3)(v)

Are precautions taken so that the water inlets will not be submerged? (3)(v)

Are water inlets on connecting tanks so installed that they terminate at least one pipe diameter above the safety overflow level of the tank? (3)(v)

Are collecting tanks so constructed as to prevent the accumulation of hazardous deposits? (3)(v)

Are pump manifolds, risers, and headers of sufficient size to insure sufficient water flow to provide efficient operation of the water chamber? (3)(vi)

Are spray rooms, including floors, constructed of masonry, concrete, or other noncombustible material? (4)(i)

Are spray rooms equipped with noncombustible fire doors and shutters? (4)(ii)

Are spray rooms adequately ventilated so that the atmosphere in the breathing zone of the operator is in accordance with 1910.94c(6)(ii)? (4)(iii)

Are spray rooms used for production spray-finishing in accordance with the requirements for spray booths as indicated above? (4)(iv)

Is the ventilation provided for spray-finishing operations in accordance with Chapter 5 of NFPA Standard No. 33-1969, in addition to the following: (5)(i)

If a fan plenum is used to equalize or control the distribution of exhaust air movement through the booth, is it of sufficient strength or rigidity to withstand the differential air pressure or other superficially imposed loads for which the equipment is designed? (5)(i)(a)

Is it also of sufficient strength to facilitate cleaning? (5)(i)(a)

	YES	NO
Is the construction at least equivalent to those of subdivision (iii) of this subparagraph noted below? (5)(i)(a)		
Is ductwork used to transport makeup air to spray booths or surrounding areas constructed of noncombustible materials? (5)(ii)		
If negative pressure exists within inlet ductwork, and there is a possibility of infiltration of harmful quantities of noxious gases, fumes, or mists from areas through which ductwork passes, are all seams and joints sealed? (5)(ii)(a)		
Is all inlet ductwork sized in accordance with volume flow requirements? (5)(ii)(b)		
Does inlet ductwork provide design air requirements at the spray booth? (5)(ii)(b)		
Is all inlet ductwork adequately supported throughout its length to sustain its own weight plus any negative pressure which is exerted upon it under normal operating conditions? (5)(ii)(c)		
Is the exhaust ductwork adequately supported through its length to sustain its weight plus any normal accumulation in interior during normal operating conditions and any negative pressure exerted upon it? (5)(iii)(a)		
Is exhaust ductwork sized in accordance with good design practice as indicated in ANSI Z9.2-1960? (5)(iii)(b)		
Are longitudinal joints in sheet steel ductwork either lock-seamed, riveted, or welded? (5)(iii)(c)		
For other than steel construction, are longitudinal joints equivalent to those required for sheet steel ductwork? (5)(iii)(c)		
Are circumferential joints in ductwork substantially fastened together and lapped in the direction of the airflow? (5)(iii)(d)		
In circumferential joints, is at least every fourth joint provided with connecting flanges, bolted together, or of equivalent fastening security? (5)(iii)(d)		
Are inspection or clean-out doors provided for every 9 to 12 feet of running length of ducts up to 12 inches in diameter, as required by ANSI Z9.1-1951? (5)(iii)(e)		
Are clean-out doors provided for servicing the fan, and where necessary, is there a drain provided? (5)(iii)(e)		

(c) Spray-finishing operations

	YES	NO
Is there an open space or fire-resistive material between the duct and any combustible roof or wall that the ductwork passes through? (5)(iii)(f)		
Are automatic fire dampers provided on both sides of the wall where the ductwork passes through fire walls? (5)(iii)(f)		
Is the ductwork used for ventilation of spray-finishing operations prohibited from being connected to ducts ventilating any other process? (5)(iii)(g)		
Is ductwork used for ventilating spray-finishing operations prohibited from being connected to ducts conveying any products of combustion? (5)(iii)(g)		
Velocity and air flow requirements.		
Where a spray booth is not equipped with an adequate air replacement system, are the minimum maintained velocities in the spray booth as indicated in Table G-10*? (6)(i)		

*See Self-Inspection Appendix

	YES	NO
In addition to the requirements in (i) above, is the total air volume exhausted through a spray booth such as to dilute solvent vapor to at least 25% of the lower explosive limit of the solvent being sprayed? (6)(ii)		

To determine the volume of air in cubic feet necessary to dilute the vapor from 1 gallon of solvent to 25% of the lower explosive limit, apply the following formula:

Dilution volume required per gallon of solvent =

$$\frac{4(100\text{—LEL})\ (\text{cubic feet of vapor per gallon})}{\text{LEL}}$$

Using toluene as the solvent.

(1) LEL of toluene from Table G-11, column 2, is 1.4%.

(2) Cubic feet of vapor per gallon from Table G-11, column 1, is 30.4 cubic feet per gallon.

(3) Dilution volume required =

$$\frac{4(100\text{—}1.4)\ 30.4}{1.4} = 8{,}564 \text{ cubic feet.}$$

(4) To convert to cubic feet per minute of required ventilation, multiply the dilution volume required per gallon of solvent by the number of gallons of solvent evaporated per minute.

	YES	NO
Is an air-supplied respirator, or other Bureau of Mines approved respirator, supplied to the operator who must position himself in a booth downstream of the object being sprayed? (6)(iii)(a)		
Where downdrafts booths are provided with doors, are these doors required to be closed when spray painting? (6)(iii)(b)		
Make-up air. (7)		
Is clean, fresh air supplied to a spray booth room in quantities equal to the volume of air exhausted through the spray booth? (7)(i)		
NOTE: Clean fresh air is that air which is free of contamination from adjacent industrial exhaust systems, chimneys, stacks, or vents.		
Where a spray booth or room receives make-up air through self-closing doors, dampers, or louvers, are they required to be fully open at all times when the booth or room is in use for spraying? (7)(ii)		
Is the velocity of air through such doors, dampers, or louvers less than 200 feet per minute? (7)(ii)		
NOTE: If the fan characteristics are such that the required air flow through the booth will be provided, higher velocities through the doors, dampers, or louvers, may be used.		
Where the air supply to a spray booth or room is filtered, is the fan static pressure calculated on the assumption that the filters are dirty to the extent that they require cleaning or replacement? (7)(iii)(a)		
Is the rating of filters governed by test data supplied by the manufacturer of the filter? (7)(iii)(b)		
Is there a pressure guage installed to show the pressure drop across the filters? (7)(iii)(b)		
Is the pressure gauge marked to show the pressure drop at which the filters require cleaning or replacement? (7)(iii)(b)		

1910.94 – VENTILATION
(c) Spray-finishing operations

	YES	NO
Are filters required to be replaced or cleaned whenever the pressure drop across them becomes excessive, or whenever the air flow through the face of the booth falls below that specified in Table G-10*? (7)(iii)(b)		
Are means for heating make-up air to any spray booth or room provided in all places where the outdoor temperature may be expected to remain below 55°F. for appreciable periods of time during the operation of the booth? (7)(iv)(a)		
Is the temperature of this make-up air at least 65° F. at the point of entry into the spray booth or spray room? (7)(iv)(a)		
If unheated air is 10° F. below room temperature, is its temperature controlled as provided in 3.6.3 of ANSI Z9.2-1960? (7)(iv)(a)		
Is the means of heating make-up air prohibited inside a spray booth? (7)(iv)(c)		
Where heating of make-up air is by coal or gas, are the products of combustion prevented from mixing with the make-up air itself? (7)(iv)(d)		
Are the products of combustion conducted outside of the building through a flue terminating at a point remote from all points where make-up air enters the building? (7)(iv)(d)		
Where make-up air to any manually operated spray booth or room is heated by gas, and the products of combustion are allowed to mix with the supply air, are the following precautions taken: (7)(iv)(f)		
Does the gas have a distinctive and strong odor to warn workmen in a spray booth or room of its presence if in an unburned state? (7)(iv)(f)		
Is the maximum rate of gas supply to the make-up air heater burners such that it will not yield in excess of 200 p.p.m. of carbon monoxide? (7)(iv)(f)(1)		
Is the maximum rate of gas supply to the make-up air heater burners such that it will not produce 2,000 p.p.m. of total combustible gases in the mixture, if there is a flame failure in the burners? (7)(iv)(f)(2)		
Is a fan provided to deliver the mixture of heated air and products of combustion from the plenum chamber housing the gas burners to the spray booth or room? (7)(iv)(f)(3)		

(d) Open surface tanks.

The next portion of the checklist applies to all operations involving the immersion of materials in liquids, or in vapors of such liquids, for the purpose of cleaning or altering the surface or adding to or imparting a finish thereto or changing the character of the materials, and their subsequent removal from the liquid or vapor, draining, and drying. These operations include washing, electroplating, anoxizing, pickling, quenching, dying, dipping, tanning, dressing, bleaching, degreasing, alkaline cleaning, stripping, rinsing, digesting, and other similar operations. This paragraph does not include molten materials handling operations or surface coating operations. (1)(i)

1910.94 – VENTILATION
(d) Open surface tanks

	YES	NO
Are all exhaust system parts, components, and supports so constructed as to meet conditions of service and to facilitate maintenance? (1)(ii)		
Are all exhaust system parts, components and supports constructed as required in ANSI Z9.2-1960? (1)(ii)		
Have considerations been given for classification of open surface tank operations as indicated in Tables G-12* and G-13*? (2)(i)		
Where ventilation is provided to reduce the concentration of the air contaminant to a degree that a hazard to the worker does not exist, is it adequate to reduce the concentration? (2)(iii)		
Control requirements.		
Do control velocities conform to Table G-14* in all cases where the flow of air past the breathing zone of the operator and into the hoods is undisturbed by local environmental conditions? (4)(i)		
The following hoods are considered to be enclosing hoods: (4)(ii) *(a)* When the hood projects over the entire tank; *(b)* When hoods are fixed in a position in such a location that the head of the workman, in all his normal operating positions, while working at the tank, is in front of all hood openings; *(c)* When hoods are completely enclosed on at least two sides; *(d)* When the quantity of air in cubic feet per minute to be exhausted through an enclosing hood is not less than the product of the control velocity times the net area of all openings in the enclosure through which air can flow into the hood.		
A tank is considered to be laterally exhausted when hoods are provided which do not project over the entire tank, and in which the direction of air movement into the hood or hoods is substantially horizontal. (4)(iii)		
Is Table G-15* used in determining the quantity of air in cubic feet per minute necessary to be laterally exhausted per square foot of tank area in order to maintain the required control velocity? (4)(iii)		
Is the total quantity of air in cubic feet per minute required to be exhausted not less than the product of the area of tank surface times the cubic feet per minute per square foot of tank area, determined from Table G-15*? (4)(iii)		
For lateral exhaust hoods over 42 inches wide, are air supply slots or orifices provided along the side or center of the tank opposite from the exhaust slots? (4)(iii)(a)		
Does the design of such systems meet the following requirements:		
(1) Does the supply air volume plus the entrained air never exceed 50 percent of the exhaust volume?		
(2) Is the velocity of the supply airstream as it reaches the effective control area of the exhaust slot, less than the effective velocity over the exhaust slot area?		

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*See Self-Inspection Appendix

(3) Is the vertical height of the receiving exhaust hood, including any baffle, more than one-quarter the width of the tank?

(4) Is the supply airstream such that it will not be allowed to impinge on obstructions between it and the exhaust slot?

(5) Are methods of measuring and adjusting supply air provided?

Are all adjustable features of the hood fixed so that they will not be altered? (4)(iii)(a)

All tanks exhausted by means of hoods which project over the entire tank, and which do not conform to the definition of enclosing hoods, are considered to be overhead canopy hoods. (4)(iv)

Is the quantity of air in cubic feet per minute necessary to be exhausted through a canopy hood not less than the product of the control velocity, times the net area of all openings between the bottom edges of the hood and the top edges of the tank? (4)(iv)

Has the rate of vapor evolution (including steam or products of combustion) from the process been estimated? (4)(v)

If the rate of vapor evolution is equal to or greater than 10 percent of the calculated exhaust volume required, has the exhaust volume been increased in equal amount? (4)(v)

Spray cleaning and degreasing.

Wherever spraying or other mechanical means are used to disperse a liquid above an open-surface tank, has a control been provided for the airborne spray? (5)

Have all such operations been enclosed as completely as possible? (5)

Is the inward air velocity into the enclosure sufficient to prevent the discharge of spray into the workroom? (5)

Control means other than ventilation.

If means other than ventilation are provided for the control of gas, mist or vapor, do they effectively reduce the concentrations of hazardous materials in the vicinity of the worker below the limits prescribed? (6)

NOTE: Other means as defined here may be tank covers, foams, beads, chips, or other materials floating on the tank surface so as to confine gases, mists, or vapors to the area under the cover or to the foam, bead, or chip layer.

System design.

Does the equipment for exhausting air have sufficient capacity to produce the flow of air required in each of the hoods and openings of the system? (7)(i)

Has the capacity in the above section been obtained when the airflow producing equipment is operating against the following pressure losses, the sum of which is the static pressure? (7)(ii)

(a) Entrance losses into the hood;

(b) Resistance to airflow in branch pipe including bends and transformations;

(c) Entrance loss into the main pipe;

(d) Resistance to airflow in main pipe including bends and transformations;

(e) Resistance of mechanical equipment; that is, filters, washers, condensers, absorbers, etc., plus their entrance and exit losses;

(f) Resistance in outlet duct and discharge stack.

Are two or more operations precluded from being connected to the same exhaust system where either one or the combination of the substances removed may constitute a fire, explosion, or chemical reaction hazard in the duct system? (7)(iii)

Are traps or other devices provided to insure that condensate in ducts does not drain back into any tank? (7)(iii)

Is the exhaust system, consisting of hoods, ducts, air mover, and discharge outlet, designed in accordance with NASI Z9.2-1960, or the manual, Industrial Ventilation, published by the American Conference of Governmental Industrial Hygienists 1970? (7)(iv)

Is airflow and pressure-loss data provided by the manufacturer of any air cleaning device included in the design calculations? (7)(iv)

Operation. (8)

Is the required airflow maintained at all times during which gas, mist, or vapor is emitted from the tank, and at all times the tank, the draining, or the drying area is in operation or use? (8)(i)

When the system was first installed, was the airflow from each hood measured by means of a Pitot traverse in the exhaust duct and corrective action taken if the flow is less than that required? (8)(i)

When the proper flow is obtained, was the hood static pressure measured and recorded? (8)(i)

Are the hoods and duct system inspected for evidence of corrosion or damage at intervals of not more than 3 months' operation? (8)(i)

In the event the airflow is found to be less than required, is it increased to the required value? (8)(i)

Does the exhaust system discharge to the outer air in such a manner that the possibility of its effluent entering any building is at a minimum? (8)(ii)

Is recirculation of the air only through a device for contaminant removal, and which will prevent the creation of a health hazard in the room or area to which the air is recirculated? (8)(ii)

1910.94 – VENTILATION
(d) Open surface tanks

	YES	NO
Is outside air, in the range of 90 percent to 110 percent of the exhaust volume, provided to each room having exhaust hoods? (8)(iii)		
Does the outside air supply enter the workroom in such a manner as not to be detrimental to any exhaust hood? (8)(iii)		
Was the airflow of the make-up air system measured on installation of the system? (8)(iii)		
Is corrective action taken when the airflow is below that required? (8)(iii)		
Is the make-up air uncontaminated? (8)(iii)		
Personal protection.		
Are all employees working in and around open-surface tank operations thoroughly instructed as to the hazards of their jobs, and in the personal protection and first aid procedures applicable to these situations? (9)(i)		
Are all persons required to work in such a manner that their feet may become wet provided with rubber or other impervious boots or shoes, rubbers, or wooden-soled shoes sufficient to keep their feet dry? (9)(ii)		
Are all persons required to handle work wet with a liquid other than water provided with gloves impervious to such a liquid, and do the gloves have sufficient length to prevent entrance of liquid into the tops? (9)(iii)		
Is the interior of such gloves kept free from corrosive or irritating contaminants? (9)(iii)		
Are all persons required to work in such a manner that their clothing may become wet provided with such aprons, coats, jackets, sleeves, or other garments made of rubber, or of other materials impervious to liquids other than water? (9)(iv)		
Do aprons extend well below the top of boots to prevent liquid splashing into the boots? (9)(iv)		
Are employees required to wear either tight-fitting chemical goggles, or an effective face shield, whenever there is a danger of splashing? (9)(v)		
In the event of an emergency such as rescue work, where concentrations of air contaminants exceed the limits or where there is less than 19.5 percent oxygen, are employees provided with and required to wear respirators adequate to reduce their exposure to a level below those limits, or to provide adequate oxygen? (9)(vi)		
Are such respirators provided in marked, quickly accessible storage compartments built for the purpose, when there exists the possibility of accidental release of hazardous concentrations of air contaminants? (9)(vi)		
Are these respirators approved by the U.S. Bureau of Mines, and are they selected by a competent industrial hygienist or other technically qualified source? Are these respirators used in accordance with 1910.134? (9)(vi)		
Are employees who may be required to wear them adequately trained in their use? (9)(vi)		

1910.94 – VENTILATION
(d) Open surface tanks

	YES	NO
Is there an adequate supply of clean cold water near each tank containing a liquid which may burn, irritate, or otherwise be harmful to the skin of a worker's body? (9)(vii)		
Is the supply of clean cold water provided through a water pipe carrying a pressure not exceeding 25 pounds? (9)(vii)		
Is a quick-opening valve and at least 48 inches of hose, at least three-quarter inch in diameter provided on the water pipe? (9)(vii)		
NOTE: As an alternate to the above, deluge showers and eye flushes may be provided in these cases. (9)(vii)		
Are employees with sores, burns, or other skin lesions requiring medical treatment prohibited from working around open-surface tanks until so authorized by a physician? (9)(viii)		
Are employees required to report any small skin abrasions, cuts, rash, or open sores immediately, so that chances of exposures to the chemicals are removed? (9)(viii)		
Do workers exposed to chromic acids have a periodic examination made of the nostrils and other parts of the body, to detect incipient ulceration? (9)(viii)		
Are sufficient washing facilities, including soap, individual towels, and hot water, provided for all persons required to use or handle any liquids which may burn, irritate, or otherwise be harmful to the skin? (9)(ix)		
Is there at least one water basin (or its equivalent) with a hot-water faucet provided for every 10 employees? (9)(ix)		
Is locker space or equivalent clothing storage facilities provided to prevent contamination of street clothing? (9)(x)		
Are first aid facilities specific to the hazards of the operations conducted readily available? (9)(x)		
Special precautions for cyanide.		
Are dikes or other arrangements provided to prevent the possibility of inter-mixing of cyanide and acid in the event of tank rupture? (10)		
Inspection, maintenance, and installation.		
Are means provided and precautions taken on floors and platforms around tanks to prevent them from becoming slippery? (11)(i)		
Are floors and platforms firm, sound, and of a design and construction to minimize the possibility of tripping? (11)(i)		
Before cleaning the interior of any tank, are the following precautions taken: (11)(ii) *(1)* Are the contents drained off? *(2)* If cleanout doors are provided, are they opened? *(3)* Are all pockets in tanks or pits, where it is possible for hazardous vapors to collect, ventilated and cleared of such vapors?		

1910.94 – VENTILATION
(d) Open surface tanks

YES NO

In view of the fact that tanks which have been drained to permit employees to enter for the purposes of cleaning, inspection, or maintenance may contain atmospheres which are hazardous to life or health, are the following precautions taken:

Prior to employee entry into such tank, are appropriate tests of the atmosphere made to determine if the limits set by subparagraph (2)(iii) of this paragraph are exceeded, or if the oxygen concentration is less than 19.5 percent? **(11)(iii)**

If the tests made in accordance with the above paragraph indicate that the atmosphere in the tank is unsafe, is the tank ventilated until the hazardous atmosphere is removed, prior to any employees' being permitted to enter the tank? **(11)(iv)**

Is the ventilation continued so as to prevent the occurrence of a hazardous atmosphere as long as an employee is in the tank? **(11)(iv)**

In the event of an emergency such as rescue work, where it is necessary to enter a tank which may contain a hazardous atmosphere, are the following precautions taken: **(11)(v)**

(1) If there is a possibility of oxygen deficiency, are employees provided with and required to wear a self-contained breathing apparatus, or a hose mask with blower. If there is no possibility of an oxygen deficient atmosphere, is a gas mask selected and operated in accordance with subparagraph (9)(vi) of this section provided and used?

(2) If a contaminant in the tank can cause dermatitis, or be absorbed through the skin, is the employee entering the tank provided with, and required to wear, protective clothing?

(3) Is there at least one trained stand-by employee, with suitable respirator, present in the nearest uncontaminated area?

(4) Is the stand-by employee able to communicate with the employee in the tank?

(5) Is provision made for the stand-by employee to haul the employee out of the tank with a lifeline, if it is necessary? **(11)(v)**

If maintenance work requiring welding or open flame work, or where toxic metal fumes such as cadmium, chromium, or lead may be evolved, are the following precautions taken:

(1) Is sufficient local exhaust ventilation provided to prevent the creation of a health hazard, or is it done with respirators selected and used in accordance with subparagraph (9)(vi) of this paragraph?

(2) Is welding or the use of open flames near any solvent cleaning equipment prohibited, except such equipment has first been thoroughly cleared of solvents and vapors? **(11)(vi)**

1910.94 – VENTILATION
(d) Open surface tanks

YES NO

Vapor degreasing tanks.

In any vapor degreasing tank equipped with a condenser or vapor-level thermostat, does the condenser or thermostat keep the level of vapors below the top edge of the tank by a distance at least equal to one-half inch of the tank width, or at least 36 inches, whichever is shorter? **(12)(i)**

If gas is used as a fuel for heating vapor degreasing tanks, are the following precautions taken: **(12)(ii)**

(1) Is the combustion chamber of a tight construction, except for such openings as the exhaust flue, and those that are necessary for supplying air for combustion?

(2) Are flues of corrosion-resistant construction and do they extend to the outer air?

(3) If mechanical exhaust is provided on this flue, is a draft diverter used?

(4) When chlorinated or fluorinated hydrocarbon solvents are used (for example, trichloroethylene, Freon) are special precautions taken to prevent solvent fumes from entering the combustion air of this or any other heater?

Are heating elements so designed and maintained that their surface temperature will not cause the solvent or mixture to decompose, break down, or be converted into an excessive quantity of vapor? **(12)(iii)**

Are tanks or machines with more than 4 square feet of vapor area, used for solvent cleaning or vapor degreasing, equipped with suitable cleanout or sludge doors located near the bottom of each tank or still? **(12)(iv)**

Are these doors so designed and gasketed that there will be no leakage of solvent when they are closed? **(12)(iv)**

1910.95 – OCCUPATIONAL NOISE EXPOSURE.

When the sound levels exceed those as shown in Table G-16, is protection against the effects of such noise exposure provided? **(a)**

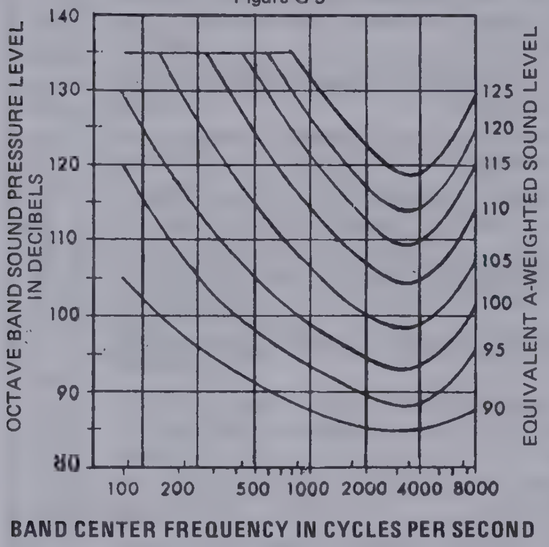
TABLE G–16–PERMISSIBLE NOISE EXPOSURES[1]

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

[1] When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1+C_2/T_2+\ldots C_n/T_n$ exceeds unity, then, the mixed exposure should be considered to exceed the limit value. C_n indicates the total time of exposure at a specified noise level, and T_n indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

If the noise levels are determined by octave band analysis, are the equivalent sound levels determined by using Figure G-9? **(a)**

Figure G-9



Equivalent sound level contours. Octave band sound pressure levels may be converted to the equivalent A-weighted sound level by plotting them on this graph and noting the A-weighted sound level corresponding to the point of highest penetration into the sound level contours. This equivalent A-weighted sound level, which may differ from the actual A-weighted sound level of the noise, is used to determine exposure limits from Table G–16.

Are feasible engineering or administrative controls utilized when employees are subjected to sound levels exceeding those listed in Table G-16? **(b)(1)**

If feasible engineering or administrative controls fail to reduce the sound levels within those established in Table G-16, is personal protective equipment provided and required to be worn? **(b)(1)**

The following items on this checklist are based on the final standard as published in the Federal Register dated March 8, 1983, and the standard of 85 decibels (dB) as previously published are still in effect.

The new standard authorizes the use of "Area Monitoring" of sound levels as opposed to "personal monitoring" in some cases.

Area monitoring can be used if the employer can show that this type of sampling strategy will produce results similar to personal sampling.

In most instances, area sampling will not be appropriate where: there are significant variations in sound levels, there is a significant amount of impulse noise present or employees move around a lot within a particular work area or between various work areas.

The employer has the burden of proof and must be able to show that the adequacy of area sampling is appropriate under the circumstances involved, and that it strikes a good balance between the need to assure adequate employee protection, yet allows the employer sufficient flexibilixy in complying with the requirements, thereby allowing the use of new or innovative techniques that do not diminish employee protection.

(c) Hearing Conservation Program.

When employee noise exposures equal or exceed an 8-hour time-weighted average (TWA) of 85 decibels measured on the A scale (slow response) or, equivalently, a dose of 50%, is a continuing, effective hearing conservation program administered? **(c)(1)**

For the purposes of the hearing conservation program, are employee noise exposures computed in accordance with Appendix A and Table G-16a without regard to any attenuation provided by the use of personal protective equipment? **(c)(1)**

Note: For the purposes of this checklist information, an 8-hour (TWA) of 85 decibels or a dose of 50% is referred to as the action level. **(c)(2)**

(d) Monitoring.

Has a monitoring program been developed and implemented when any employee's exposure may equal or exceed an 8-hour TWA of 85 decibels? **(d)(1)**

Has the sampling strategy been designed to identify employees for inclusion in the hearing conservation program? **(d)(1)(i)**

Has the proper selection of hearing protectors been made for all such employees? **(d)(1)(i)**

Have you determined that area monitoring is the sampling strategy for your plant?
If so, have you taken into consideration high worker mobility, significant variations of sound levels, and a significant component of impulse noise in making such determination? Do you have sufficient proof of this? **(d)(1)(ii)**

If you have determined that area monitoring cannot be used, have you used personal sampling methods that will protect *all* employees? **(d)(1)(ii)**

Have all continuous, intermittent, and impulsive sound levels from 80 decibels to 130 decibels been integrated into the noise measurements? **(d)(2)(i)**

Have the instruments that are used to measure noise exposure been calibrated to ensure measurement accuracy? **(d)(2)(ii)**

Has monitoring been repeated whenever a change in production, process, equipment, or controls increased noise exposures to:

Additional employees being exposed at or above the action level? **(d)(3)(i)**

When attenuation provided by hearing protectors is rendered inadequate to meet the requirements of paragraph (j)? **(d)(3)(ii)**

(e) Employee Notification.

Has each employee that has been exposed at or above an 8-hour TWA of 85 decibels been notified of the results of the monitoring? **(e)**

(f) Observation of Monitoring.

Have employees or their representatives been provided with an opportunity to observe any noise measurements that have been conducted? **(f)**

	YES	NO
(g) Audiometric Testing Program. Has an audiometric testing program been established and maintained by making such testing available to all employees whose exposures equal or exceed an 8-hour TWA of 85 decibels? (g)(1)		
Is such testing provided at no cost to the employee? (g)(2)		
Are audiometric tests performed by one of the following: A licensed or certified audiologist; An otolaryngologist; Other physician; A technician certified by the Council of Accreditation in Occupational Hearing Conservation; or A technician who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining, and checking calibration and proper functioning of the audiometers used? (g)(3)		
Note: A technician performing these tests must be responsible to an audiologist, otolaryngologist, or physician.		
Do all audiograms meet the requirements of Appendix C: Audiometric Measuring Instruments? (g)(4)		
Has a baseline audiogram been established within 6 months of an employee's first exposure at or above the action level (85 decibels)? (g)(5)(i)		
Note: Exception when using mobile test vans.		
Are all baseline audiograms obtained within 1 year of the employee's first exposure? (g)(5)(ii)		
Are employees provided with, and required to use, hearing protectors after the first 6 months following their first exposure at or above the action level? (g)(5)(ii)		
Are employees required to wear the hearing protection until the baseline audiogram is conducted? (g)(5)(ii)		
Do employees have at least 14 hours without exposure to workplace noise prior to making the baseline audiogram? (g)(5)(iii)		
Note: Use of hearing protectors by employees may be substituted for the above 14 hours free of exposure to workplace noise.		
Are employees advised of the need to avoid high levels of nonoccupational noise exposure during the 14-hour period immediately preceeding the audiometric examination? (g)(5)(iv)		
Is an annual audiogram obtained or scheduled to be obtained after the baseline audiogram is conducted for each employee exposed at or above the action level? (g)(6)		
Is each employee's annual audiogram compared to that employee's baseline audiogram to determine if the annual audiogram is valid, and to see if there has been a standard threshold shift (STS)? (g)(7)(i)		
Note: This comparison may be made by a technician. Note: If an employee's annual audiogram shows that he has suffered an STS, another audiogram may be made within 30 days and considered to be the results of the annual audiogram. (g)(7)(ii)		
Does an audiologist, otolaryngologist, or physician review problem audiograms? (g)(7)(iii)		
Do such evaluations determine whether there is a need for further evaluation? (g)(7)(iii)		
Has the employer provided to the person accomplishing the above evaluation the following information: (g)(7)(iii)		
A copy of the requirements for hearing conservation as set forth in paragraph (c) through (n) of this section? 3(g)(7)(iii)(A)		
The baseline and most recent audiograms of the employee involved? (g)(7)(iii)(B)		
Measurements of background sound pressure levels in the audiometric room as required by Appendix D: Audiometric Test Rooms? (g)(7)(iii)(C)		
Records of the audiometer calibrations required by paragraph (h)(5)? (g)(7)(iii)(D)		
Are there procedures in place that, when an employee's audiogram indicates there has been an STS between the annual and baseline audiograms, the employee will be notified within 21 days? (g)(8)(i)		
STS is a change in hearing threshold relative to the baseline audiogram of an average of 10dB or more at 2000, 3000, and 4000 Hz in either ear. When a physician determines that the STS is work-related or aggravated by occupational noise exposure, are the following steps taken by the employer: (g)(8)(ii)		
Are employees who are not wearing hearing protectors fitted with hearing protectors, trained in the use and care, and required to wear them? (g)(8)(ii)(A)		
Are employees who already use hearing protectors, refitted with protectors with greater attenuation and trained in their care and use? (g)(8)(ii)(B)		
Are employees referred for a clinical audiological evaluation or an otological examination, if additional testing is necessary, or if there is a suspicion that there is medical pathology of the ear caused or aggravated by the hearing protectors being worn? (g)(8)(ii)(C)		
Is the employee informed of the need for an otological examination if there is a suspicion that medical pathology indicates that it is unrelated to the wearing of hearing protectors? (g)(8)(ii)(D)		
If, on subsequent audiometric testing, there is an indication that an employee whose exposure to noise levels is less than the TWA of 90 decibels for an 8-hour day and has an STS that is not persistent, does the employer: Inform the employee of the new audiometric information? (g)(8)(iii)(A)		
Note: The required use of hearing protectors may be discontinued. (g)(8)(iii)(B)		

1910.95 – OCCUPATIONAL NOISE EXPOSURE
(h) Audiometric test requirements

	YES	NO
Are annual audiograms substituted for baseline audiograms when, in the judgment of the audiologist, otolaryngologist, or physician who is evaluating the program that:		
The standard threshold shift revealed by the audiogram is persistent? or: (g)(9)(i)		
When the hearing threshold shown in the annual audiogram indicates a significant improvement over the baseline audiogram? (g)(9)(ii)		
When determining an STS, is a change in hearing threshold relative to the baseline audiogram of an average of 10dB or more at 2000, 3000, and 4000 Hz, in either ear used? (g)(10)(i)		
When determining whether an STS has occurred, has there been an allowance made for the process of aging (presbycusis) to the change in hearing by correcting the annual audiogram as described in Appendix F: Calculations and Applications of Age Correction to Audiograms?* (g)(10)(ii)		
(h) Audiometric test requirements.		
Are audiometric tests pure tone, air conduction, hearing threshold examinations, with test frequencies of 500, 1000, 2000, 3000, 4000, and 6000 Hz? (h)(1)		
Are tests for each frequency taken separately for each ear? (h)(1)		
Are audiometric tests conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, the American National Standard Specification S3.6-1969? (h)(2)		
Do pulsed-tone and self-recording audiometers, if used, meet the requirements specified in Appendix C: Audiometric Measuring Instruments?* (h)(3)		
Are audiometric examinations administered in a room meeting the requirements shown in Appendix D: Audiometric Test Room?* (h)(4)		
Is the functional operation of audiometers checked before each day's use by testing a person with known, stable hearing thresholds? (h)(5)(i)		
Are they also checked by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds? (h)(5)(i)		
Note: Deviations of 10dB or greater require an acoustic calibration.		
Are audiometer calibrations checked at least annually in accordance with Appendix E?* (h)(5)(ii)		
Note: Deviations of 15dB or greater require an exhaustive calibration.		
Is an exhaustive calibration performed at least every two years in accordance with sections 4.1.2; 4.1.3; 4.1.4.3; 4.2; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard S3.6-1969? (h)(5)(iii)		

*Appendices noted in this section are provided under the Red Tab - Self-Inspection Appendix, in Subpart G, pages G(a)-02-B1 to G(a)-02-G.

1910.95 – OCCUPATIONAL NOISE EXPOSURE
(i) Hearing Protectors

	YES	NO
(i) Hearing Protectors.		
Are hearing protectors made available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to employees? (i)(1)		
Are hearing protectors replaced as necessary? (i)(1)		
Is it assured that hearing protectors are being worn by:		
Employees required to wear them by paragraph (b)(1)? (i)(2)(i)		
Employees who are exposed to an 8-hour time-weighted average of 85dB or greater? (i)(2)(ii)		
An employee who has not yet had a baseline audiogram established? (i)(2)(ii)(A)		
An employee who has experienced an STS? (i)(2)(ii)(B)		
Are employees given the opportunity to select their hearing protectors from a variety of suitable protectors provided by the employer? (i)(3)		
Is training provided in the use and care of the hearing protectors provided to the employees? (i)(4)		
Is the proper initial fitting and supervision of the correct usage of hearing protectors assured? (i)(5)		
(j) Hearing Protector Attenuation.		
Is there an evaluation conducted for hearing protector attenuation for the specific noise environments in which the protector will be used? (j)(1)		
Is one of the methods described in Appendix B* used in this determination? (j)(1)		
Do all hearing protectors attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels as required by paragraph (b)? (j)(2)		
Do hearing protectors, provided to employees who have experienced an STS, attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or below? (j)(3)		
Is there a reevaluation of the hearing protector attenuation whenever employee noise exposure increases to the extent that the protectors originally provided may no longer give adequate protection? (j)(4)		
Are more effective hearing protectors provided where necessary? (j)(4)		
(k) Training Program.		
Is a training program instituted for all employees who are exposed at or above an 8-hour time-weighted average of 85 decibels? (k)(1)		
Is there assurance of employee participation in this program? (k)(1)		
Is the training program repeated annually for each employee included in the hearing conservation program? (k)(2)		
Is information, provided in the annual retraining program, updated to be consistent with changes in protective equipment and work processes that have occurred? (k)(2)		

Is it assured that each employee is informed of the following:

The effects of noise on hearing? **(k)(3)(i)**

The purposes, advantages, disadvantages, and attenuation of various types of hearing protection and instructions on selection, fitting, use and care? **(k)(3)(ii)**

The purpose of audiometric testing and an explanation of the test procedures? **(k)(3)(iii)**

(l) Access to information and training materials.

Is a copy of this standard made available to affected employees or their representatives? **(l)(1)**

Is a copy of this standard also posted in the workplace? **(l)(1)**

Are procedures in place whereby any information materials that may be provided to the employer by the Assistant Secretary will be provided to the affected employees? **(l)(2)**

Are procedures in place for the provision of all materials related to the employer's training and education program to this standard, upon the request of the Assistant Secretary or the Director of NIOSH? **(l)(3)**

(m) Recordkeeping.

Is an accurate record of all employee exposure measurements required by paragraph (d) being maintained? **(m)(1)**

Are all employee audiometric test records obtained pursuant to paragraph (g) being retained? **(m)(2)(i)**

Do these records include:

Name and job classification of the employee? **(m)(2)(ii)(A)**

Date of the audiogram? **(m)(2)(ii)(B)**

The examiner's name? **(m)(2)(ii)(C)**

Date of the last acoustic or exhaustive calibration of the audiometer? **(m)(2)(ii)(D)**

The employee's most recent noise exposure assessment? **(m)(2)(ii)(E)**

Are accurate records of the measurements of the background sound pressure levels in audiometric test rooms being maintained? **(m)(2)(ii)(F)**

Are the records required by this paragraph (m) being retained for the periods indicated as follows: **(m)(3)**

Noise exposure measurements for two years? **(m)(3)(i)**

Audiometric tests records for the duration of the employee's employment? **(m)(3)(ii)**

Are there procedures established whereby records required by this section will be provided to employees, former employees, representatives of individual employees and the Assistant Secretary, upon their request? **(m)(4)**

Note: The provisions of 29 CFR 1910.20 (a)-(e) and (g)-(i) apply to access to records under this section.

If the employer ceases to do business, are there provisions made to transfer all records required to be maintained to the new employer? **(m)(5)**

Note: The successor employer is required to retain records for the remainder of the period prescribed in (m)(3) above.

(n) Appendices.

Appendices A, B, C, D, and E are incorporated as part of this section, and the contents of these are MANDATORY. **(n)(1)**

Appendices F and G are intended to be informational and are NOT mandatory. **(n)(2)**

(o) Exemptions.

The contents of paragraphs (c) through (n) of this self-inspection checklist do not apply to employers engaged in oil and gas well drilling and servicing operations.

(p) Startup Date.

Are arrangements made to ensure that all baseline audiograms required by paragraph (g) will be completed by March 1, 1984? **(p)**

1910.96 – IONIZING RADIATION.

YES NO

(b) Exposure of individuals to radiation in restricted areas.

Is the possession, use, or transfer source of ionizing radiation accomplished in such a manner that will prevent employees in restricted areas from exposure to doses in excess of those listed in Table G-18*? (1)

If employees in restricted areas are exposed to doses in excess of those listed in the table, are all of the following requirements met: (2)

(i) Is the whole body dose in any calendar quarter limited to not more than 3 rems?

(ii) Is the whole body dose, when added to the accumulated occupational dose to the whole body, limited to 5 times (N-18) rems?

NOTE: 'N' equals the individual's age in years at his last birthday.

(iii) Are adequate records maintained showing past and current exposure which show that the addition of such a dose will not cause the individual to exceed the amount authorized in this subparagraph?

Are employees under 18 years old limited to a dose of 10 percent or less in any one calendar quarter of those listed in Table G-18*? (3)

Have calendar quarters been established, and are they the same each calendar year? (4)

(c) Exposure to airborne radioactive material.

Is the possession, use or transporting of radioactive materials done in such a manner that will prevent employees in restricted areas from being exposed to airborne radioactive materials that have an average concentration less than the limits specified in Table 1 of Appendix B to 10, CFR Part 20? (1)

Is the possession, use or transporting of radioactive materials done in such a manner that will prevent employees in restricted areas under 18 years of age from being exposed to airborne radioactive materials having an average concentration less than the limits specified in Table II of Appendix B to 10, CFR Part 20? (1)

(d) Precautionary procedures and personal monitoring.

Are evaluation surveys made of the radiation hazards incident to the production, use, release, disposal, or presence of radioactive materials or other sources of radiation under a specific set of conditions? (1)

When appropriate, do such evaluations include a physical survey of the location of materials and equipment, and measurements of levels of radiation or concentrations of radioactive material present? (1)

Are employees provided with appropriate personnel monitoring equipment? (2)

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*See Self-Inspection Appendix

1910.96 – IONIZING RADIATION

(d) Precautionary procedures and personal monitoring

YES NO

Is such personnel monitoring equipment provided to each employee who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25 percent of the applicable value specified in Table G-18*? (2)(i)

Is such personnel monitoring equipment provided to each employee under 18 years of age, who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 5 percent of the applicable value specified in Table G-18*? (2)(ii)

Is such personnel monitoring equipment provided to each employee who enters a high radiation area? (2)(iii)

(e) Caution signs, labels, and signals.

Are signs provided with radiation symbol as shown in Fig. G-10*? (1)

Is each radiation area conspicuously posted with a sign or signs bearing the radiation symbol, plus the words:

CAUTION
RADIATION AREA

(2)

Is each high radiation area provided with a conspicuously posted sign or signs bearing the radiation caution symbol, plus the words:

CAUTION
HIGH RADIATION AREA

(3)(i)

Is each high radiation area equipped with a control device which causes the radiation level to be reduced below that at which an employee might receive a dose of 100 millirems in 1 hour, or (3)(ii)

Is each high radiation area equipped with a conspicuous visible or audible signal that will make the employee entering the activity and the supervisor of the activity aware of such entry? (3)(ii)

Airborne radioactivity area.

Is each airborne radioactivity area conspicuously posted with a sign or signs bearing the radiation caution symbol, plus the words:

DANGER
AIRBORNE RADIOACTIVITY AREA

(4)(ii)

Additional requirements.

Is each area or room in which radioactive material is used or stored, and which contains any radioactive material (other than natural uranium or thorium) in any amount exceeding 10 times the quantity of such material specified in Appendix C to 10 CFR Part 20, conspicuously posted with a sign or signs bearing the radiation caution symbol, plus the words:

DANGER
RADIOACTIVE MATERIALS

(5)(i)

1910.96 – IONIZING RADIATION
(e) Caution signs, labels, and signals

	YES	NO
Is each area or room where natural uranium or thorium is used or stored in an amount exceeding 100 times the quantity of such material specified in 10 CFR Part 20, conspicuously posted with a sign or signs bearing the radiation caution symbol, plus the words: DANGER RADIOACTIVE MATERIALS (5)(ii)		
Containers. Is each container in which is transported, stored, or used a quantity of any radioactive material (other than natural uranium or thorium) greater than the quantity of such material specified in Appendix C to 10 CFR Part 20, labeled with a durable, clearly visible label bearing the radiation caution symbol, plus the words: DANGER RADIOACTIVE MATERIALS (6)(i)		
Is each container in which natural uranium or thorium is transported, stored, or used in a quantity greater than 10 times the quantity specified in Appendix C to 10 CFR Part 20, labeled with a durable, clearly visible label bearing the radiation caution symbol, plus the words: CAUTION RADIOACTIVE MATERIALS (6)(ii)		
Where containers are used for storage, do the labels required also state the quantities and kinds of radioactive materials in the containers and the date of measurement of the quantities? (6)(iv)		

(f) Immediate evacuation warning signal.

	YES	NO
Is the signal a midfrequency complex sound wave amplitude modulated at a subsonic frequency? (1)(i)		
Does the complex sound wave in free space have a fundamental frequency between 450 and 500 hertz, modulated at a subsonic rate between 4 and 5 hertz? (1)(i)		
Does the signal generator have not less than 75 decibels at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential? (1)(ii)		
Are there a sufficient number of signal units installed so that the requirements of subdivision (ii) above are met at every location where an individual may be present whose immediate, rapid, and complete evacuation is essential? (1)(iii)		
Is the immediate evacuation warning signal unique in the plant or facility in which it is installed? (1)(iv)		
Is the duration of the signal sufficient to insure that all affected persons hear the signal? (1)(v)		
Does the signal-generating system respond automatically to an initiating event without requiring any human action to sound the signal? (1)(vi)		

1910.96 – IONIZING RADIATION
(f) Intermediate evacuation warning signal

	YES	NO
Is the signal-generating system so designed to incorporate components which enable the system to produce the desired signal each time it is activated within one-half second of activation? (2)(i)		
Is the signal-generating system provided with an automatically activated secondary power supply which is adequate to simultaneously power all emergency equipment to which it is connected? (2)(ii)		
Are all components of the signal-generating system so located to provide maximum practicable protection against damage in case of fire, explosion, corrosive atmosphere, or other environmental extremes consistent with adequate system performance? (2)(iii)		
Is the signal-generating system designed with the minimum number of components necessary to make it function as intended? (2)(iv)		
When the warning signal system is equipped with several activating devices, are precautions taken to preclude the inoperability of the system should one of the activating devices fail? (2)(v)		
Is the signal-generating system so designed to enhance the probability that alarm occurs only when immediate evacuation is warranted? (2)(vi)		
Are the number of false alarms not so great that the signal will come to be disregarded? (2)(vi)		
Are the number of false alarms low enough to minimize personal injuries or excessive property damage that might result from such evacuation? (2)(vi)		
Are initial tests, inspections, and checks of the signal-generating system made to verify that the fabrication and installation were made in accordance with design plans and specifications? (3)(i)		
Are initial tests, inspections, and checks of the signal-generating system made to develop a thorough knowledge of the performance of the system and all components under normal and hostile conditions? (3)(i)		
Are periodic tests, inspections, and checks made to minimize the possibility of malfunction? (3)(ii)		
Are tests and checks made following significant alterations or revisions to the system? (3)(iii)		
Are tests designed to minimize hazards while conducting such tests? (3)(iv)		
Prior to normal operations, is the signal-generating system checked physically and functionally to assure reliability and to demonstrate accuracy and performance? (3)(v)		
Do such specific tests include the following:		
(a) All power sources.		
(b) Calibration and calibration stability.		
(c) Trip levels and stability.		
(d) Continuity of function with loss and return of required services such as AC or DC power, air pressure, etc.		

1910.96 – IONIZING RADIATION
(f) Intermediate evacuation warning signal

YES NO

(e) All indicators.

(f) Trouble indicator circuits and signals, where used.

(g) Air pressure (if used).

(h) To determine that the sound level of the signal is between the fundamental frequency of 450 to 500 hertz modulated at a subsonic rate of between 4 and 5 hertz?

Are periodic scheduled performance tests and status checks made to insure that the system is at all times operating within design limits and capable of the required response? (3)(vi)

Do specific periodic tests or checks include:

(a) Adequacy of signal-activation devices?

(b) All power sources?

(c) Function of all alarm circuits and trouble indicator circuits including trip levels?

(d) Air pressure (if used)?

(e) Function of entire system including operation without power when required?

(f) Complete operational tests, including sounding of the signal and determination that sound levels are adequate?

Are periodic tests made on the basis of need, experience, difficulty, and disruption of operations? (3)(vii)

Is the entire system operationally tested at least quarterly? (3)(vii)

Are all employees whose work may necessitate their presence in an area covered by the signal made familiar with the actual sound of the signal at their work location? (3)(viii)

(i) Instruction of personnel, posting.

The following applies to all employers who are not regulated by the Atomic Energy Commission, nor employers in an Atomic Energy Commision-agreement State: (see 1910.96 (p)(3)

All employers, other than the above, are regulated by the following:

Are all employees working in or frequenting any portion of a radiation area informed of the occurrence of radioactive materials or of radiation in such portions of the radiation area? (2)

Are all such employees instructed in the safety problems associated with exposure to such materials or radiation and in precautions or devices to minimize exposure? (2)

Are all such employees instructed in applicable provisions of this section for the protection of employees from exposure to radiation or radioactive materials? (2)

Are all such employees advised of reports of radiation exposure which employees may request pursuant to the regulations in this section? (2)

1910.96 – IONIZING RADIATION
(i) Instruction of personel posting

YES NO

Does each employer to whom this section applies have posted a current copy of its provisions and a copy of the operating procedures applicable to the work, conspicuously, in such locations as to insure that employees working in or frequenting radiation areas will observe these documents on the way to and from their place of employment? (3)

Are such documents available for examination of employees upon request? (3)

(j) Storage of radioactive materials.

Are radioactive materials stored in a non-radiation area secured against unauthorized removal from the place of storage?

(k) Waste disposal.

Is the disposal of radioactive material only by transfer to an authorized recipient, or in a manner approved by the Atomic Energy Commission or a state approved as an agreement-State by the Atomic Energy Commission?

(l) Notification of incidents.

The following applies to all employers not protected by the Atomic Energy Commission, or an Atomic Energy Commision-agreement State: (see 1910.96 (p)(3) (1)

Are procedures established so that the Assistant Secretary of Labor or his authorized representative are notified by telephone or telegraph of any incident involving radiation which may have caused, or threatens to cause, any of the following:

(i) Exposure of the whole body of any individual to 25 rems or more of radiation; exposure of the skin of the whole body of any individual to 150 rems or more of radiation; exposure of the feet, ankles, hands, or forearms of any individual to 375 rems or more of radiation.

(ii) The release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limit specified for such materials in Table II of Appendix B to 10 CFR Part 20.

Are procedures established whereby within 24 hours following its occurrence, the Assistant Secretary of Labor or his duly authorized representative will be notified by telephone or telegraph of any incident involving radiation which may have caused or threatened to cause the following: (2)

(i) Exposure of the whole body of any individual to 5 rems or more of radiation; exposure of the skin of the whole body of any individual to 30 rems or more of radiation; exposure of the feet, ankles, hands, or forearms to 75 rems or more of radiation.

(m) Reports of overexposure and excessive levels and concentrations.

In addition to the immediate notification and/or 24-hour notifications required by paragraph (1), are procedures established whereby the employer will make a report in writing within 30 days to the Assistant Secretary of Labor or his duly authorized representative of each exposure of an individual to radiation or concentrations of radioactive material in excess of any applicable limit in this section? (1)

Does each such report describe the extent of exposure of persons to radiation or to radioactive material, the levels of radiation and concentration of radioactive material involved, the cause of the exposure, the levels of concentrations, the corrective steps taken or planned to assure against a recurrence? (1)(i)

Are procedures established whereby each individual exposed to radiation or concentrations of radioactive material will be notified of the nature and extent of exposure, and is such notice in writing and does it contain the following statement: "You should preserve this report for future reference."? (2)

(n) Records.

Are records maintained of the radiation exposure of all employees for whom personnel monitoring is required, and are such employees notified of their individual exposure on at least an annual basis? (1)

Do such records use the same units as indicated in Table G-18*, or to those tables in Appendix B to 10 CFR Part 20? (2)

(o) Disclosure to former employee of individual employee's record.

Are procedures established whereby upon the the request of a former employee, he will be furnished a report of the employee's exposure to radiation? (1)

Are procedures established whereby such report will be furnished within 30 days from the time of the request? (1)

Does the record requested by the employee cover each calendar quarter of his employment involving exposure to radiation, or such lesser period as may be requested by the employee? (1)

Does the report also include the results of any calculations and analysis of radioactive material deposited in the body of the employee? (1)

(p) Atomic Energy Commission licensees – AEC contractors operating AEC plants and facilities – AEC agreement State licensees or registrants.

AEC-agreement State licensees or registrants: (3)

Atomic Energy Act sources.

Any employer who possesses or uses source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has either registered such sources with, or is operating under a license issued by, a State has an agreement in effect with the Atomic Energy Commission pursuant to section 274(b) (42 U.S.C. 2021(b)) of the Atomic Energy Act of 1954, as amended, and in accordance with the requirements of that State's laws and regulations shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned, unless the Secretary of Labor, after conference with the Atomic Energy Commission, shall determine that the State's program for control of these radiation sources is incompatible with the requirements of this section. Such agreements currently are in effect only in the States of Alabama, Arkansas, California, Kansas, Kentucky, Florida, Mississippi, New Hampshire, New York, North Carolina, Texas, Tennessee, Oregon, Idaho, Arizona, Colorado, Louisiana, Nebraska, Washington, Maryland, North Dakota, South Carolina, and Georgia. (3)(i)

Other Sources.

Any employer who possesses or uses radiation sources other than source material, byproduct material, or special nuclear material, as defined in the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), and has either registered such sources with, or is operating under a license issued by a State which has an agreement in effect with the Atomic Energy Commission pursuant to section 274(b) (42 U.S.C. 2021(b)) of the Atomic Energy Act of 1954, as amended, and in accordance with the requirements of that State's laws and regulations shall be deemed to be in compliance with the radiation requirements of this section, insofar as his possession and use of such material is concerned, provided the State's program for control of these radiation sources is the subject of a currently effective determination by the Assistant Secretary of Labor that such program is compatible with the requirements of this section. Such determinations currently are in effect only in the States of Alabama, Arkansas, California, Kansas, Kentucky, Florida, Mississippi, New Hampshire, New York, North Carolina, Texas, Tennessee, Oregon, Idaho, Arizona, Colorado, Louisiana, Nebraska, Washington, Maryland, North Dakota, South Carolina, and Georgia. (3)(ii)

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*See Self-Inspection Appendix

1910.97 – NONIONIZING RADIATION

YES NO

(a) Electromagnetic Radiation. (a)

Scope. (a)(4)

This section applies to all radiations originating from radio stations, radar equipment, and other possible sources of electromagnetic radiation such as used for communication, radio navigation, and industrial and scientific purposes. (a)(4)

This section does not apply to the deliberate exposure of patients by, or under the direction of, practitioners of the healing arts. (a)(4)

Definitions. (a)(1)

The following definitions are applicable to this section: (a)(1)

The term "electromagnetic radiation" is restricted to that portion of the spectrum commonly defined as the radio frequency region, which for the purpose of this specification shall include the microwave frequency region. (a)(1)(i)

Partial body irradiation. Pertains to the case in which part of the body is exposed to the incident electromagnetic energy. (a)(1)(ii)

Radiation protection guide. Radiation level which should not be exceeded without careful consideration of the reasons for doing so. (a)(1)(iii)

The word "symbol" as used in this specification refers to the overall design, shape, and coloring of the rf radiation sign shown in figure G-11.* (a)(1)(iv)

Whole body irradiation. Pertains to the case in which the entire body is exposed to the incident electromagnetic energy or in which the cross section of the body is smaller than the cross section of the incident radiation beam. (a)(1)(v)

Radiation Protection Guide. (a)(2)

Is the following Radiation Protection Guide used:

For normal environmental conditions and for incident electromagnetic energy of frequencies from 10 MHz to 100 GHz, the radiation protection guide is 10 mW/cm.^{2} (milliwatt per square centimeter) as averaged over any possible 0.1-hour period. This means the following:

Power density: 10mW./cm.^{2} for periods of 0.1-hour or more.

Energy density: 1 mW.-hr./cm.^{2} (milliwatt hour per square centimeter) during any 0.1-hour period.

This guide applies whether the radiation is continuous or intermittent. (a)(2)(i)

These formulated recommendations pertain to both whole body irradiation and partial body irradiation. Partial body irradiation must be included since it has been shown that some parts of the human body (e.g., eyes, testicles) may be harmed if exposed to incident radiation levels significantly in excess of the recommended levels. (a)(2)(ii)

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*See Self-Inspection Appendix.

1910.97 – NONIONIZING RADIATION

YES NO

Warning symbol. (a)(3)

Is the warning symbol as specified in figure G-11* used for identifying radio frequency radiation hazards? (a)(3)(i)&(ii)

Is appropriate warning information or precautionary instructions indicated in the lower triangle of the warning symbol? (a)(3)(iii)

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*See Self-Inspection Appendix.

TABLE G-4 – Grinding and Abrasive Cutting-off Wheels

Wheel diameter (inches)	Wheel width (inches)	Minimum exhaust volume (feet^3/min.)
To 9	1½	220
Over 9 to 16	2	390
Over 16 to 19	3	500
Over 19 to 24	4	610
Over 24 to 30	5	880
Over 30 to 36	6	1,200

TABLE G-5 – Buffing and Polishing Wheels

Wheel diameter (inches)	Wheel width (inches)	Minimum exhaust volume (feet^3/min.)
To 9	2	300
Over 9 to 16	3	500
Over 16 to 19	4	610
Over 19 to 24	5	740
Over 24 to 30	6	1,040
Over 30 to 36	6	1,200

TABLE G-6—Horizontal Single-Spindle Disc Grinder

Disc diameter (inches):	*Exhaust volume (ft.^{3}/min.)*
Up to 12	220
Over 12 to 19	390
Over 19 to 30	610
Over 30 to 36	880

TABLE G-7 – Horizontal Double-Spindle Disc Grinder

Disc diameter (inches):	*Exhaust volume (ft.^{3}/min.)*
Up to 19	610
Over 19 to 25	880
Over 25 to 30	1,200
Over 30 to 53	1,770
Over 53 to 72	6,280

TABLE G-8 – Vertical Spindle Disc Grinder

Disc diameter (inches)	One-half or more of disc covered		Disc not covered	
	Number[1]	Exhaust foot^3/min.	Number[1]	Exhaust foot^3/min.
Up to 20	1	500	2	780
Over 20 to 30	2	780	2	1,480
Over 30 to 53	2	1,770	4	3,530
Over 53 to 72	2	3,140	5	6,010

[1] Number of exhaust outlets around periphery of hood, or equal distribution provided by other means.

TABLE G-9 – Grinding and Polishing Belts

Belts width (inches):	*Exhaust volume (ft.^{3}/min.)*
Up to 3	220
Over 3 to 5	300
Over 5 to 7	390
Over 7 to 9	500
Over 9 to 11	610
Over 11 to 13	740

TABLE G-10 – Minimum Maintained Velocities Into Spray Booths

Operating conditions for objects completely inside booth	Crossdraft, f.p.m.	Airflow velocities, f.p.m.	
		Design	Range
Electrostatic and automatic airless operation contained in booth without operator.	Negligible	50 large booth	50–75
		100 small booth	75–125
Air-operated guns, manual or automatic	Up to 50	100 large booth	75–125
		150 small booth	125–175
Air-operated guns, manual or automatic	Up to 100	150 large booth	125–175
		200 small booth	150–250

NOTES:

(1) Attention is invited to the fact that the effectiveness of the spray booth is dependent upon the relationship of the depth of the booth to its height and width.

(2) Crossdrafts can be eliminated through proper design and such design should be sought. Crossdrafts in excess of 100 fpm (feet per minute) should not be permitted.

(3) Excessive air pressures result in loss of both efficiency and material waste in addition to creating a backlash that may carry overspray and fumes into adjacent work areas.

(4) Booths should be designed with velocities shown in the column headed "Design." However, booths operating with velocities shown in the column headed "Range" are in compliance with this standard.

TABLE G-11 – Lower Explosive Limit of Some Commonly Used Solvents

Solvent	Cubic feet of vapor per gallon of liquid at 70° F	Lower explosive limit in percent by volume of air at 70° F
	Column 1	*Column 2*
Acetone	44.0	2.6
Amyl Acetate (iso)	21.6	[1]1.0
Amyl Alcohol (n)	29.6	1.2
Amyl Alcohol (iso)	29.6	1.2
Benzene	36.8	[1]1.4
Butyl Acetate (n)	24.8	1.7
Butyl Alcohol (n)	35.2	1.4
Butyl Cellosolve	24.8	1.1
Cellosolve	33.6	1.8
Cellosolve Acetate	23.2	1.7
Cyclohexanone	31.2	[1]1.1
1,1 Dichloroethylene	42.4	5.6
1,2 Dichloroethylene	42.4	9.7
Ethyl Acetate	32.8	2.5
Ethyl Alcohol	55.2	4.3
Ethyl Lactate	28.0	[1]1.5
Methyl Acetate	40.0	3.1
Methyl Alcohol	80.8	7.3
Methyl Cellosolve	40.8	2.5
Methyl Ethyl Ketone	36.0	1.8
Methyl n-Propyl Ketone	30.4	1.5
Naphtha (VM&P) (76° Naphtha)	22.4	0.9
Naphtha (100° Flash) Safety Solvent—Stoddard Solvent	23.2	1.1
Propyl Acetate (n)	27.2	2.0
Propyl Acetate (iso)	28.0	1.8
Propyl Alcohol (n)	44.8	2.1
Propyl Alcohol (iso)	44.0	2.0
Toluene	30.4	1.4
Turpentine	20.8	0.8
Xylene (o)	26.4	1.0

[1] At 212° F.

TABLE G-12 – Determination of Hazard Potential

Hazard potential	Toxicity group		
	Gas or vapor (p.p.m.)	Mist (mg./m[3])	Flash point (in degrees F.)
A	0-10	0-0.1	
B	11-100	0.11-1.0	Under 100
C	101-500	1.1-10	100-200
D	Over 500	Over 10	Over 200

TABLE G-13 – Determination of Rate of Gas, Vapor, or Mist Evolution

Rate	Liquid temperature,° F.	Degrees below boiling point	Relative evaporation [2]	Gassing [3]
1	Over 200	0-20	Fast	High.
2	150-200	21-50	Medium	Medium.
3	94-149	51-100	Slow	Low.
4	Under 94	Over 100	Nil	Nil.

TABLE G-14 – Control Velocities in Feet Per Minute (F.P.M.) for Undisturbed Locations

Class	Enclosing hood		Lateral exhaust [1]	Canopy hood [2]	
	One open side	Two open sides		Three open sides	Four open sides
B-1 and A-2	100	150	150	Do not use	Do not use
A-3 (Note 2), B-1, B-2, and C-1	75	100	100	125	175
A-3, C-2, and D-1 (Note 3)	65	90	75	100	150
B-4 (Note 2), C-3, and D-2 (Note 3)	50	75	50	75	125
A-4, C-4, D-3 (Note 3), and D-4	General room ventilation required.				

NOTES:
1. See Table G-15 for computation of ventilation rate.
2. Do not use canopy hood for Hazard Potential A processes.
3. Where complete control of hot water is desired, design as next highest class.

TABLE G-15 – Minimum Ventilation Rate in Cubic Feet of Air Per Minute Per Square Foot of Tank Area for Lateral Exhaust

Required minimum control velocity, f.p.m. (from Table G-14)	C.f.m. per sq. ft. to maintain required minimum velocities at following ratios (tank width (W) /tank length (L)).[1],[2]				
	0. 0–0. 09	0. 1–0. 24	0. 25–0. 49	0. 5–0. 99	1. 0–2. 0
Hood along one side or two parallel sides of tank when one hood is against a wall or baffle.[2] Also for a manifold along tank centerline.[3]					
50	50	60	75	90	100
75	75	90	110	130	150
100	100	125	150	175	200
150	150	190	225	260	300
Hood along one side or two parallel sides of free standing tank not against wall or baffle.					
50	75	90	100	110	125
75	110	130	150	170	190
100	150	175	200	225	250
150	225	260	300	340	375

[1] It is not practicable to ventilate across the long dimension of a tank whose ratio $\frac{W}{L}$ exceeds 2.0.

It is undesirable to do so when $\frac{W}{L}$ exceeds 1.0. For circular tanks with lateral exhaust along up to ½ the circumference, use $W/L=1.0$; for over one-half the circumference use $W/L=0.5$.

[2] Baffle is a vertical plate the same length as the tank, and with the top of the plate as high as the tank is wide. If the exhaust hood is on the side of a tank against a building wall or close to it, it is perfectly baffled.

[3] Use $\frac{W}{2}$ as tank width in computing when manifold is along centerline, or when hoods are used on two parallel sides of a tank.

Tank Width (W) means the effective width over which the hood must pull air to operate (for example, where the hood face is set back from the edge of the tank, this set back must be added in measuring tank width). The surface area of tanks can frequently be reduced and better control obtained (particularly on conveyorized systems) by using covers extending from the upper edges of the slots toward the center of the tank.

TABLE G-16 – Permissible Noise Exposures

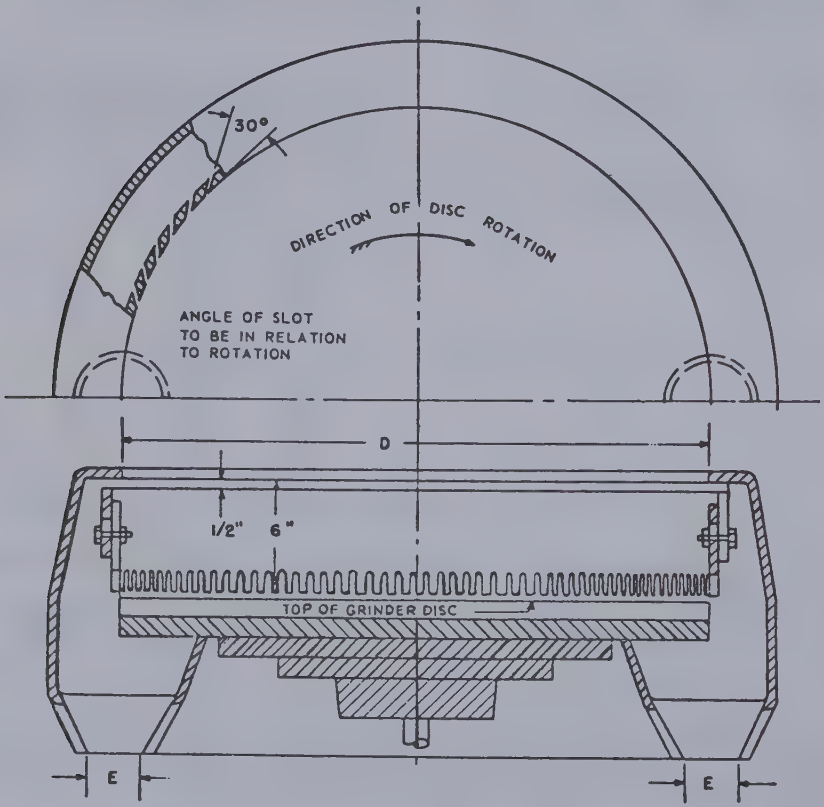
Duration per day, hours	*Sound level dBA slow response*
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

TABLE G-17 – Neutron Flux Dose Equivalents

Neutron energy (million electron volts (MEV))	Number of neutrons per square centimeter equivalent to a dose of 1 rem (neutrons/cm²)	Average flux to deliver 100 millirem in 40 hours (neutrons/cm² per sec.)
Thermal	970 × 10^6	670
0.0001	720 × 10^6	500
0.005	820 × 10^6	570
0.02	400 × 10^6	280
0.1	120 × 10^6	80
0.5	43 × 10^6	30
1.0	26 × 10^6	18
2.5	29 × 10^6	20
5.0	26 × 10^6	18
7.5	24 × 10^6	17
10	24 × 10^6	17
10 to 30	14 × 10^6	10

TABLE G-18 – Exposure to Ionizing Radiation

	Rems per calendar quarter
Whole body: Head and trunk; active blood-forming organs; lens of eyes; or gonads	1¼
Hands and forearms; feet and ankles	18¾
Skin of whole body	7½

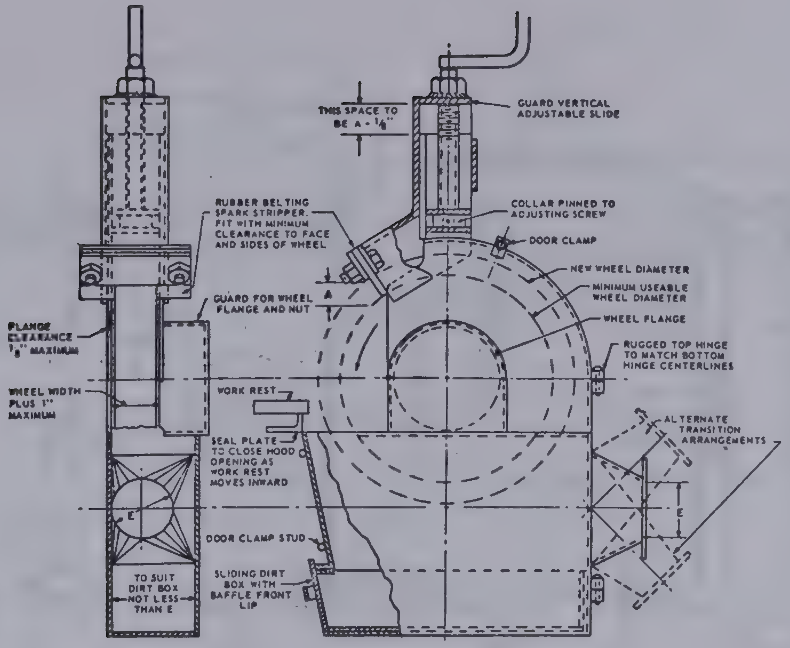

30°
DIRECTION OF DISC ROTATION
ANGLE OF SLOT TO BE IN RELATION TO ROTATION
D
1/2"
6"
TOP OF GRINDER DISC
E
E

Dia *D*, Inches		Exhaust *E*		Volume Exhausted at 4,500 ft/min ft³/min	Note
Min	Max	No. Pipes	Dia.		
	20	1	4½	500	When one-half or more of the disc can be hooded, use exhaust ducts as shown at the left.
Over 20	30	2	4	780	
Over 30	72	2	6	1,770	
Over 53	72	2	8	3,140	
	20	2	4	780	When no hood can be used over disc, use exhaust ducts as shown at left.
Over 20	30	2	5½	1,480	
Over 30	53	4	6	3,530	
Over 53	72	5	7	6,010	

Entry loss = 1.0 slot velocity pressure + 0.5 branch velocity pressure
Minimum slot velocity = 2,000 ft/min – ½-inch slot width

FIGURE G-1 – Vertical Spindle Disc Grinder Exhaust Hood and Branch Pipe Connections

P10


THIS SPACE TO BE A - 1/8"
GUARD VERTICAL ADJUSTABLE SLIDE
RUBBER BELTING SPARK STRIPPER. FIT WITH MINIMUM CLEARANCE TO FACE AND SIDES OF WHEEL
COLLAR PINNED TO ADJUSTING SCREW
DOOR CLAMP
NEW WHEEL DIAMETER
MINIMUM USEABLE WHEEL DIAMETER
A
GUARD FOR WHEEL FLANGE AND NUT
WHEEL FLANGE
FLANGE CLEARANCE 1/8" MAXIMUM
RUGGED TOP HINGE TO MATCH BOTTOM HINGE CENTERLINES
WHEEL WIDTH PLUS 1" MAXIMUM
WORK REST
ALTERNATE TRANSITION ARRANGEMENTS
SEAL PLATE TO CLOSE HOOD OPENING AS WORK REST MOVES INWARD
E
DOOR CLAMP STUD
TO SUIT DIRT BOX NOT LESS THAN E
SLIDING DIRT BOX WITH BAFFLE FRONT LIP

Wheel Dimension			Exhaust Outlet, Inches	Volume of Air at 4,500 ft/min
Diameter, Inches		Width, Inches		
Min = *d*	Max = *D*	Max	*E*	
	9	1½	3	220
Over 9	16	2	4	390
Over 16	19	3	4½	500
Over 19	24	4	5	610
Over 24	30	5	6	880
Over 30	36	6	7	1,200

Entry loss = 0.45 velocity pressure for tapered takeoff
0.65 velocity pressure for straight takeoff

FIGURE G-2 – Standard Grinder Hood

NOTE: Baffle to reduce front opening as much as possible

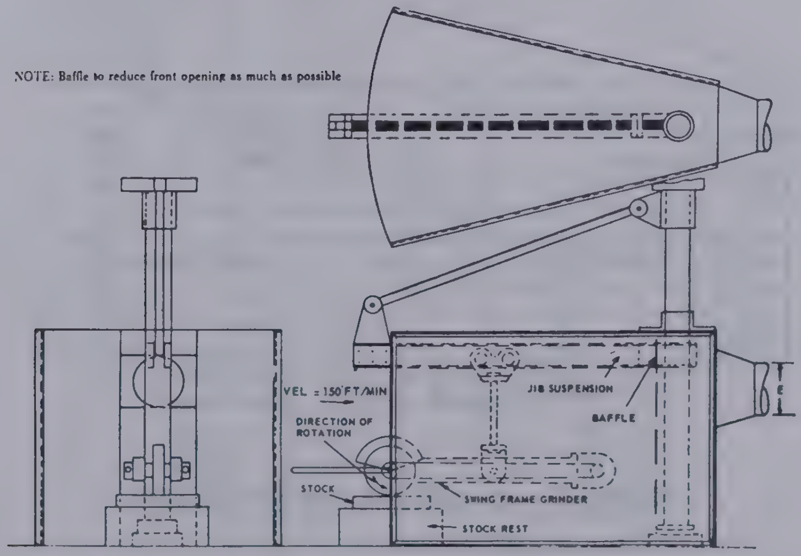
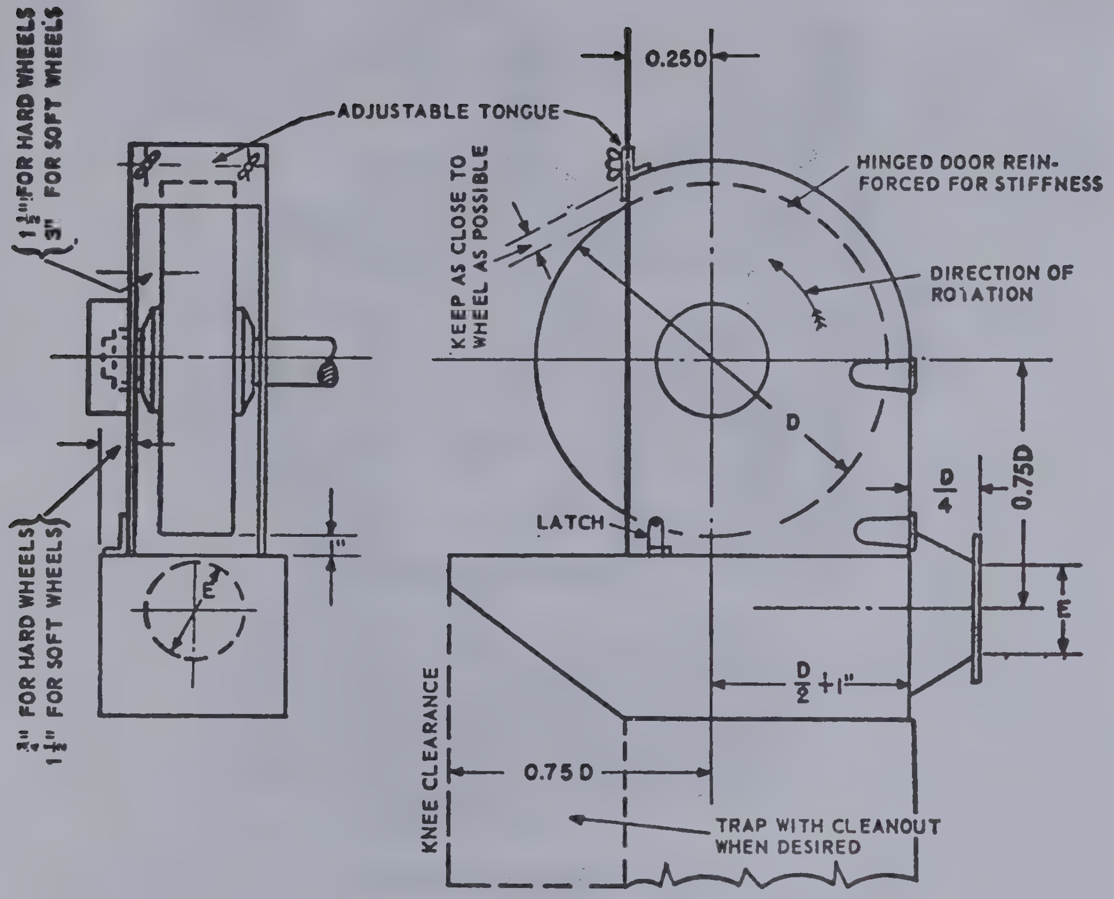


FIGURE G-3 – A Method of Applying an Exhaust Enclosure to Swing-Frame Grinders



Wheel Dimension, Inches			Exhaust Outlet, Inches	Volume of Air at 4,500 ft/min
Diameter		Width		
Min = *d*	Max = *D*	Max	*E*	
	9	2	3½	300
Over 9	16	3	4	500
Over 16	19	4	5	610
Over 19	24	5	5½	740
Over 24	30	6	6½	1,040
Over 30	36	6	7	1,200

Entry loss = 0.15 velocity pressure for tapered takeoff
0.65 velocity pressure for straight takeoff

FIGURE G-4 – Standard Buffing and Polishing Hood

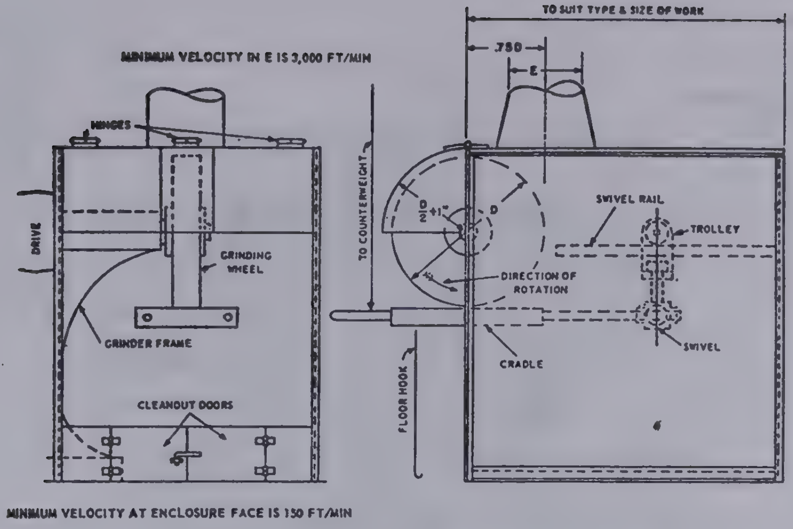
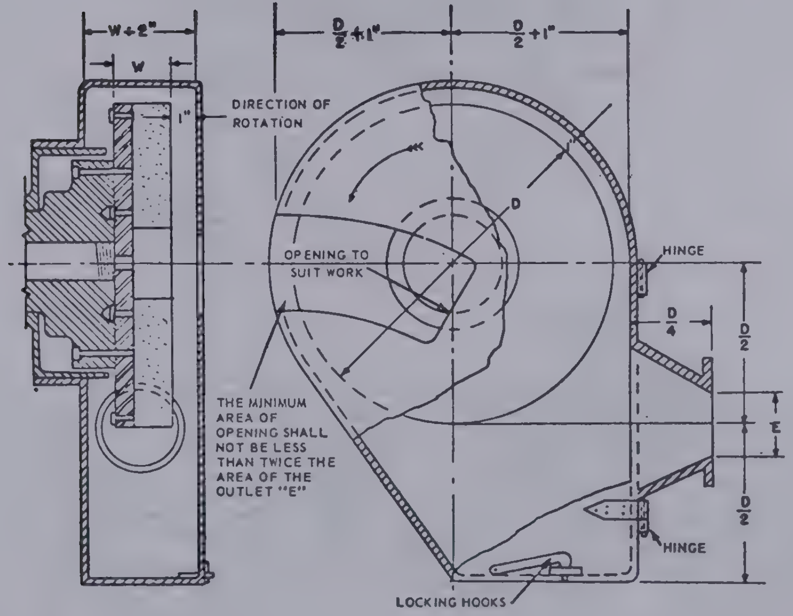


FIGURE G-5 – Cradle Polishing or Grinding Enclosure

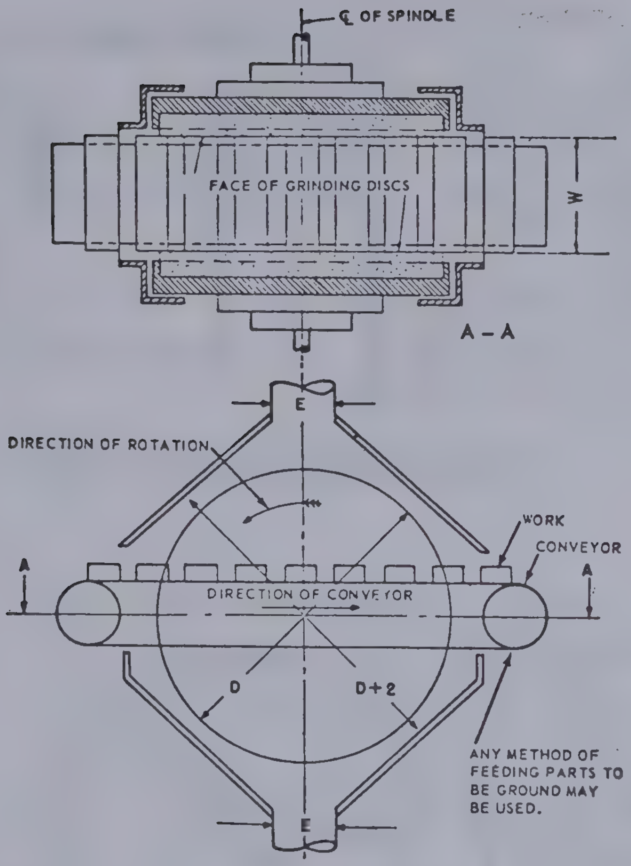


Dia *D*, Inches		Exhaust *E*	Volume Exhausted at 4,500 ft/min ft³/min
Min	Max	Dia. Inches	
	12	3	220
Over 12	19	4	390
Over 19	30	5	610
Over 30	36	6	880

NOTE: If grinding wheels are used for disc grinding purposes, hoods must conform to structural strength and materials as described in 9.1.

Entry loss = 0.45 velocity pressure for tapered takeoff

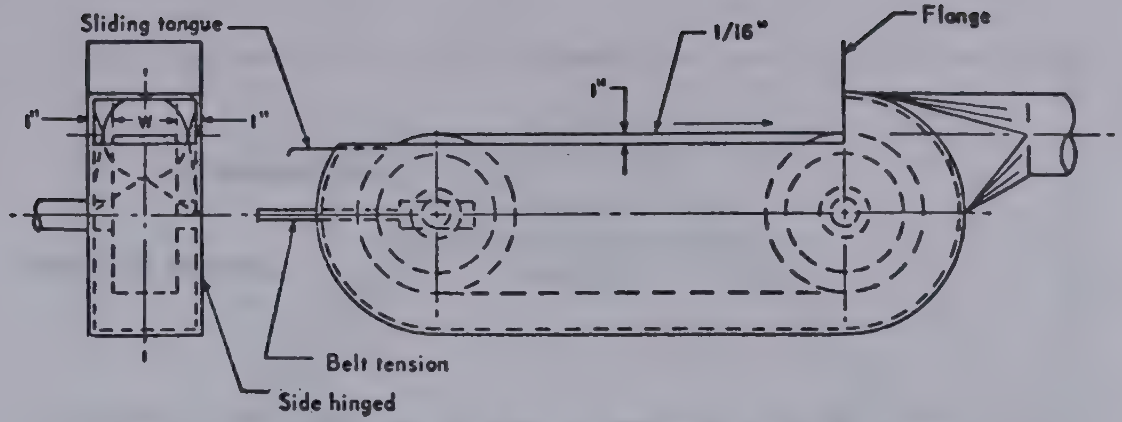
FIGURE G-6 – Horizontal Single-Spindle Disc Grinder Exhaust Hood and Branch Pipe Connections



Disc Dia, Inches		Exhaust *E*		Volume Exhausted at 4.500 ft/min ft³/min	Note
Min	Max	No. Pipes	Dia		
	19	1	5	610	When width "W" permits, exhaust ducts should be as near heaviest grinding as possible.
Over 19	25	1	6	880	
Over 25	30	1	7	1.200	
Over 30	53	2	6	1.770	
Over 53	72	4	8	6.280	

Entry loss = 0.45 velocity pressure for tapered takeoff

FIGURE G-7 – Horizontal Double-Spindle Disc Grinder Exhaust Hood and Branch Pipe Connections



Belt Width W. Inches	Exhaust Volume, ft³/min
up to 3	220
3 to 5	300
5 to 7	390
7 to 9	500
9 to 11	610
11 to 13	740

Minimum duct velocity = 4.500 ft/min branch, 3.500 ft/min main
Entry loss = 0.45 velocity pressure for tapered takeoff
0.65 velocity pressure for straight takeoff

FIGURE G-8 – A Typical Hood for a Belt Operation

P10

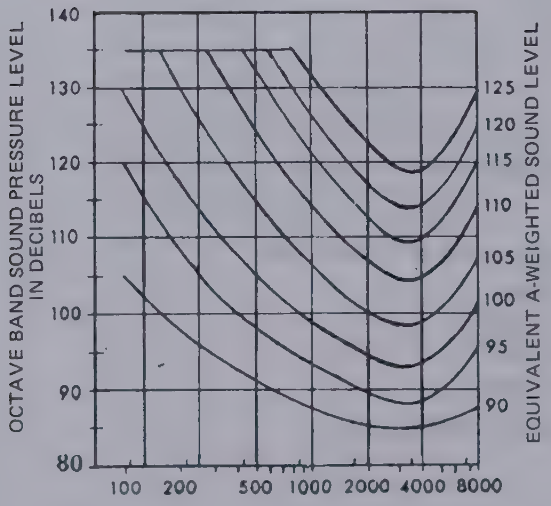
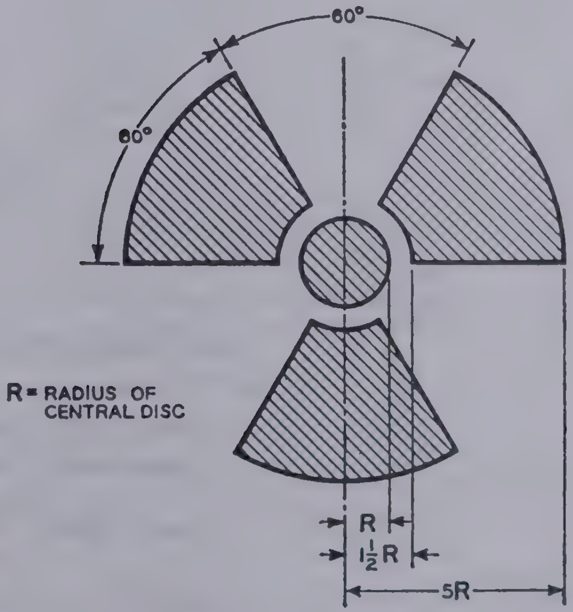
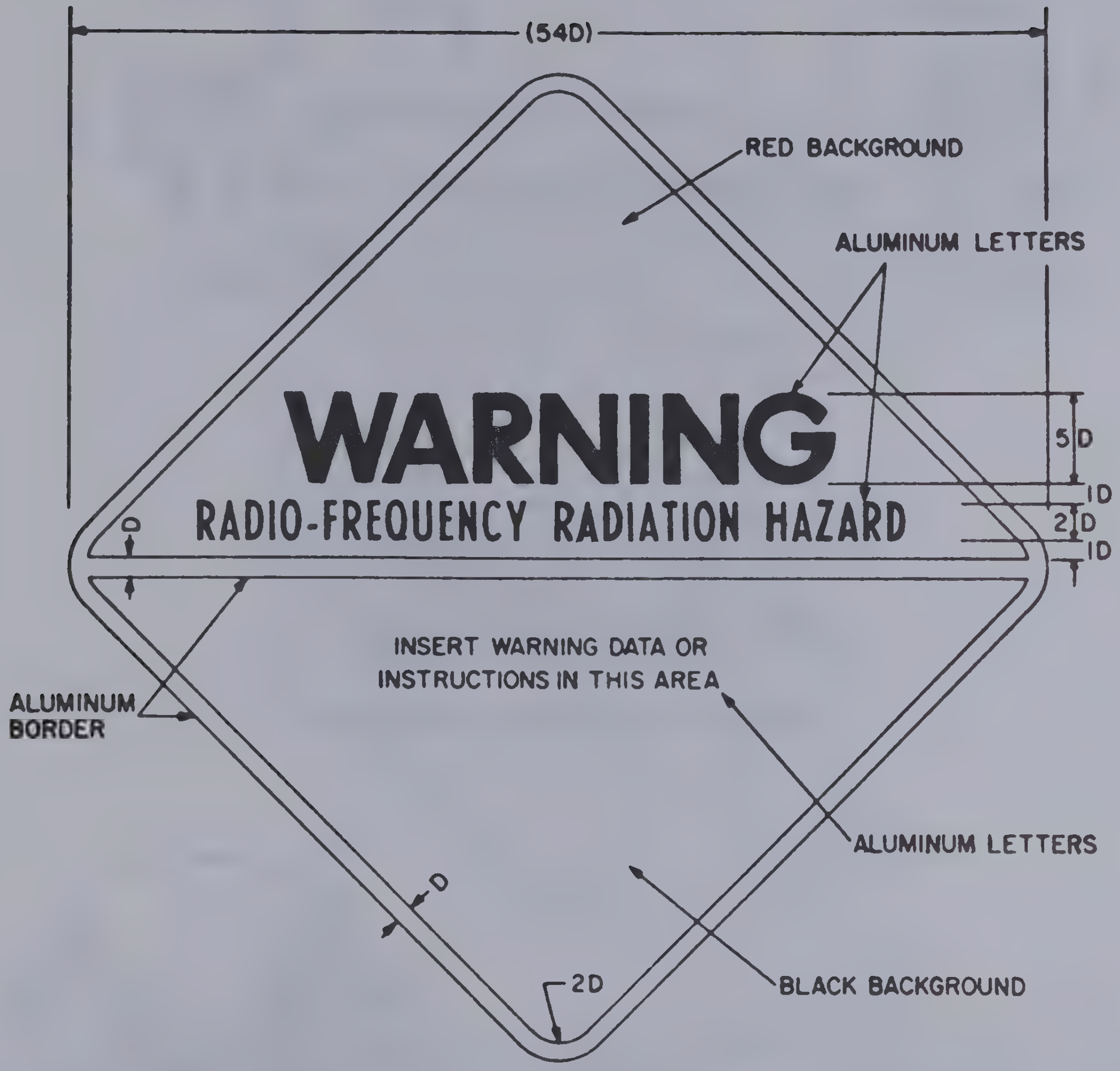


FIGURE G-9 – Band Center Frequency in Cycles Per Second



1. Cross-hatched area is to be magenta or purple.
2. Background is to be yellow.

FIGURE G-10 – Standard Radiation Symbol



1. Place handling and mounting instructions on reverse side.
2. D = Scaling unit.
3. Lettering: Ratio of letter height to thickness of letter lines.

Upper triangle:	5 to 1 — large
	6 to 1 — medium
Lower triangle:	4 to 1 — small
	6 to 1 — medium

4. Symbol is square; triangles are right-angle isosceles.

P10

FIGURE G-11 – Radio-Frequency Radiation Hazard Warning Symbol

1910.95 OCCUPATIONAL NOISE EXPOSURE

APPENDIX A
NOISE EXPOSURE COMPUTATION
(Mandatory)

Appendix A: Noise Exposure Computation

This Appendix is Mandatory

I. Computation of Employee Noise Exposure

(1) Noise dose is computed using Table G–16a as follows: *

(i) When the sound level, L, is constant over the entire work shift, the noise dose, D, in percent, is given by: $D=100\ C/T$ where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given in Table G–16a or by the formula shown as a footnote to that table.

(ii) When the workshift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by: $D=100\ (C_1/T_1+C_2/T_2+\ldots+C_n/T_n)$, where C_n indicates the total time of exposure at a specific noise level, and T_n indicates the reference duration for that level as given by Table G–16a.

(2) The eight-hour time-weighted average sound level (TWA), in decibels, may be computed from the dose, in percent, by means of the formula: $TWA=16.61 \log_{10} (D/100)+90$. For an eight-hour workshift with the noise level constant over the entire shift, the TWA is equal to the measured sound level.

(3) A table relating dose and TWA is given in Section II.

II. Conversion Between "Dose" and "8-Hour Time-Weighted Average" Sound Level

Compliance with paragraphs (c)–(r) of this regulation is determined by the amount of exposure to noise in the workplace. The amount of such exposure is usually measured with an audiodosimeter which gives a readout in terms of "dose." In order to better understand the requirements of the amendment, dosimeter readings can be converted to an "8-hour time-weighted average (TWA) sound level".

In order to convert the reading of a dosimeter into TWA, see Table A–1, * below. This table applies to dosimeters that are set by the manufacturer to calculate dose or percent exposure according to the relationships in Table G–16a. So, for example, a dose of 91 percent over an eight hour day results in a TWA of 89.3 dB, and, a dose of 50 percent corresponds to a TWA of 85 dB.

If the dose as read on the dosimeter is less than or greater than the values found in Table A–1, the TWA may be calculated by using the formula: $TWA=16.61 \log_{10} (D/100)+90$ where TWA=8-hour time-weighted average sound level and D=accumulated dose in percent exposure.

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*Tables G–16a and A–1 are on the next page.

Table G-16a

A-weighted sound level, L (decibel)	Reference duration, T (hour)
80	32
81	27.9
82	24.3
83	21.1
84	18.4
85	16
86	13.9
87	12.1
88	10.6
89	9.2
90	8
91	7.0
92	6.2
93	5.3
94	4.6
95	4
96	3.5
97	3.0
98	2.6
99	2.3
100	2
101	1.7
102	1.5
103	1.4
104	1.3
105	1
106	0.87
107	0.76
108	0.66
109	0.57
110	0.5
111	0.44
112	0.38
113	0.33
114	0.29
115	0.25
116	*0.22*
117	*0.19*
118	*0.16*
119	*0.14*
120	*0.125*
121	*0.11*
122	*0.095*
123	*0.082*
124	*0.072*
125	*0.063*
126	*0.054*
127	*0.047*
128	*0.041*
129	*0.036*
130	*0.031*

In the above table the reference duration, T, is computed by

$$T=\frac{8}{2^{(L-90)/5}}$$

where L is the measured A-weighted sound level.

Table A-1
Conversion From "Percent Noise Exposure" or "Dose" to "8-Hour Time-Weighted Average Sound Level" (TWA)

Dose or percent noise exposure	TWA
10	73.4
15	76.3
20	78.4
25	80.0
30	81.3
35	82.4
40	83.4
45	84.2
50	85.0
55	85.7
60	86.3
65	86.9
70	87.4
75	87.9
80	88.4
81	88.5
82	88.6
83	88.7
84	88.7
85	88.8
86	88.9
87	89.0
88	89.1
89	89.2
90	89.2
91	89.3
92	89.4
93	89.5
94	89.6
95	89.6
96	89.7
97	89.8
98	89.9
99	89.9
100	90.0
101	90.1
102	90.1
103	90.2
104	90.3
105	90.4
106	90.4
107	90.5
108	90.6
109	90.6
110	90.7
111	90.8
112	90.8
113	90.9
114	90.9
115	91.1
116	91.1
117	91.1
118	91.2
119	91.3
120	91.3
125	91.6
130	91.9
135	92.2
140	92.4
145	92.7
150	92.9
155	93.2
160	93.4
165	93.6
170	93.8
175	94.0
180	94.2
185	94.4
190	94.6
195	94.8
200	95.0
210	95.4
220	95.7
230	96.0
240	96.3
250	96.6
260	96.9
270	97.2
280	97.4
290	97.7
300	97.9
310	98.2
320	98.4
330	98.6
340	98.8
350	99.0
360	99.2
370	99.4
380	99.6
390	99.8
400	100.0
410	100.2
420	100.4
430	100.5
440	100.7
450	100.8
460	101.0
470	101.2
480	101.3
490	101.5
500	101.6
510	101.8
520	101.9
530	102.0
540	102.2
550	102.3
560	102.4
570	102.6
580	102.7
590	102.8
600	102.9
610	103.0
620	103.2
630	103.3
640	103.4
650	103.5
660	103.6
670	103.7
680	103.8
690	103.9
700	104.0
710	104.1
720	104.2
730	104.3
740	104.4
750	104.5
760	104.6
770	104.7
780	104.8
790	104.9
800	105.0
810	105.1
820	105.2
830	105.3
840	105.4
850	105.4
860	105.5
870	105.6
880	105.7
890	105.8
900	105.8
910	105.9
920	106.0
930	106.1
940	106.2
950	106.2
960	106.3
970	106.4
980	106.5
990	106.5
999	106.6

APPENDIX B
METHODS FOR ESTIMATING THE ADEQUACY OF HEARING PROTECTOR ATTENUATION
(Mandatory)

For employees who have experienced a significant threshold shift, hearing protector attenuation must be sufficient to reduce employee exposure to a TWA of 85 dB. Employers must select one of the following methods by which to estimate the adequacy of hearing protector attenuation.

The most convenient method is the Noise Reduction Rating (NRR) developed by the Environmental Protection Agency (EPA). According to EPA regulation, the NRR must be shown on the hearing protector package. The NRR is then related to an individual worker's noise environment in order to assess the adequacy of the attenuation of a given hearing protector. This Appendix describes four methods of using the NRR to determine whether a particular hearing protector provides adequate protection within a given exposure environment. Selection among the four procedures is dependent upon the employer's noise measuring instruments.

Instead of using the NRR, employers may evaluate the adequacy of hearing protector attenuation by using one of the three methods developed by the National Institute for Occupational Safety and Health (NIOSH), which are described in the "List of Personal Hearing Protectors and Attenuation Data," HEW Publication No. 76-120, 1975, pages 21-37. These methods are known as NIOSH methods #1, #2 and #3. The NRR described below is a simplification of NIOSH method #2. The most complex method is NIOSH method #1, which is probably the most accurate method since it uses the largest amount of spectral information from the individual employee's noise environment. As in the case of the NRR method described below, if one of the NIOSH methods is used, the selected method must be applied to an individual's noise environment to assess the adequacy of the attenuation. Employers should be careful to take a sufficient number of measurements in order to achieve a representative sample for each time segment.

Note — The employer must remember that calculated attenuation values reflect realistic values only to the extent that the protectors are properly fitted and worn.

When using the NRR to assess hearing protector adequacy, one of the following methods must be used:

(i) When using a dosimeter that is capable of C-weighted measurements:

(A) Obtain the employee's C-weighted dose for the entire workshift, and convert to TWA (see Appendix A, II).

(B) Subtract the NRR from the C-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(ii) When using a dosimeter that is not capacle of C-weighted measurements, the following method may be used:

(A) Convert the A-weighted dose to TWA (see Appendix A).

(B) Subtract 7 dB from the NRR.

(C) Subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(iii) When using a sound level meter set to the A-weighting network:

(A) Obtain the employee's A-weighted TWA.

(B) Subtract 7 dB from the NRR, and subtract the remainder from the A-weighted TWA to obtain the estimated A-weighted TWA under the ear protector.

(iv) When using a sound level meter set on the C-weighting network:

(A) Obtain a representative sample of the C-weighted sound levels in the employee's environment.

(B) Subtract the NRR from the C-weighted average sound level to obtain the estimated A-weighted TWA under the ear protector.

(v) When using area monitoring procedures and a sound level meter set to the A-weighting network:

(A) Obtain a representative sound level for the area in question.

(B) Subtract 7 dB from the NRR and subtract the remainder from the A-weighted sound level for that area.

(vi) When using area monitoring procedures and a sound level meter set to the C-weighting network:

(A) Obtain a representative sound level for the area in question.

(B) Subtract the NRR from the C-weighted sound level for that area.

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Appendix C
Audiometric Measuring Instruments
(Mandatory)

1. In the event that pulsed-tone audiometers are used, they shall have a tone on-time of at least 200 milliseconds.

2. Self-recording audiometers shall comply with the following requirements:

(A) The chart upon which the audiogram is traced shall have lines at positions corresponding to all multiples of 10 dB hearing level within the intensity range spanned by the audiometer. The lines shall be equally spaced and shall be separated by at least 1/4 inch. Additional increments are optional. The audiogram pen tracings shall not exceed 2 dB in width.

(B) It shall be possible to set the stylus manually at the 10-dB increment lines for calibration purposes.

(C) The slewing rate for the audiometer attenuator shall not be more than 6 dB/sec except that an initial slewing rate greater than 6 dB/sec is permitted at the beginning of each new test frequency, but only until the second subject response.

(D) The audiometer shall remain at each required test frequency for 30 seconds (±3 seconds). The audiogram shall be clearly marked at each change of frequency and the actual frequency change of the audiometer shall not deviate from the frequency boundaries marked on the audiogram by more than ±3 seconds.

(E) It must be possible at each test frequency to place a horizontal line segment parallel to the time axis on the audiogram, such that the audiometric tracing crosses the line segment at least six times at that test frequency. At each test frequency the threshold shall be the average of the midpoints of the tracing excursions.

Appendix D
Audiometric Test Rooms
(Mandatory)

After April 15, 1983, rooms used for audiometric testing shall not have background sound pressure levels exceeding those in Table D–1 when measured by equipment conforming at least to the Type 2 requirements of American National Standard Specification for Sound Level Meters, S1.4–1971 (R1976), and to the Class II requirements of American National Standard Specification for Octave, Half-Octave, and Third-Octave Band Filter Sets, S1.11–1971 (R1976).

Table D–1.—*Maximum Allowable Octave-Band Sound Pressure Levels for Audiometric Test Rooms*

Octave-band center frequency (Hz)	500	1000	2000	4000	8000
Sound pressure level (dB)	27	30	35	42	41

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APPENDIX E
ACOUSTIC CALIBRATION OF AUDIOMETERS
(Mandatory)

Audiometer calibration shall be checked acoustically, at least annually, according to the procedures described in this Appendix. The equipment necessary to perform these measurements is a sound level meter, octave-band filter set, and a National Bureau of Standards 9A coupler. In making these measurements, the accuracy of the calibrating equipment shall be sufficient to determine that the audiometer is within the tolerances permitted by American National Standard Specification for Audiometers, S3.6–1969.

(1) *Sound Pressure Output Check*

A. Place the earphone coupler over the microphone of the sound level meter and place the earphone on the coupler.

B. Set the audiometer's hearing threshold level (HTL) dial to 70 dB.

C. Measure the sound pressure level of the tones at each test frequency from 500 Hz through 6000 Hz for each earphone.

D. At each frequency the readout on the sound level meter should correspond to the levels in Table E–1 or Table E–2, as appropriate, for the type of earphone, in the column entitled "sound level meter reading."

(2) *Linearity Check*

A. With the earphone in place, set the frequency to 1000 Hz and the HTL dial on the audiometer to 70 dB.

B. Measure the sound levels in the coupler at each 10-dB decrement from 70 dB to 10 dB, noting the sound level meter reading at each setting.

C. For each 10-dB decrement on the audiometer the sound level meter should indicate a corresponding 10 dB decrease.

D. This measurement may be made electrically with a voltmeter connected to the earphone terminals.

(3) *Tolerances*

When any of the measured sound levels deviate from the levels in Table E–1 or Table E–2 by ± 3 dB at any test frequency between 500 and 3000 Hz, 4 dB at 4000 Hz, or 5 dB at 6000 Hz, an exhaustive calibration is advised. An exhaustive calibration is required if the deviations are greater than 10 dB at any test frequency.

Table E-1.—*Reference Threshold Levels for Telephonics—TDH-39 Earphones*

Frequency, Hz	Reference threshold level for TDH-39 earphones, dB	Sound level meter reading, dB
500	11.5	81.5
1000	7	77
2000	9	79
3000	10	80
4000	9.5	79.5
6000	15.5	85.5

Table E-2.—*Reference Threshold Levels for Telephonics—TDH-49 Earphones*

Frequency, Hz	Reference threshold level for TDH-39 earphones, dB	Sound level meter reading, dB
500	13.5	83.5
1000	7.5	77.5
2000	11	81.0
3000	9.5	79.5
4000	10.5	80.5
6000	13.5	83.5

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APPENDIX F
CALCULATIONS AND APPLICATIONS OF AGE CORRECTIONS TO AUDIOGRAMS
(Non-Mandatory)

In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging to the change in hearing level by adjusting the most recent audiogram. If the employer chooses to adjust the audiogram, the employer shall follow the procedure described below. This procedure and the age correction tables were developed by the National Institute for Occupational Safety and Health in the criteria document entitled "Criteria for a Recommended Standard . . . Occupational Exposure to Noise," [(HSM)-11001].

For each audiogram test frequency:

(i) Determine from Tables F-1 or F-2 the age correction values for the employee by:

(A) Finding the age at which the most recent audiogram was taken and recording the corresponding values of age corrections at 1000 Hz through 6000 Hz;

(B) Finding the age at which the baseline audiogram was taken and recording the corresponding values of age corrections at 1000 Hz through 6000 Hz.

(ii) Subtract the values found in step (i)(A) from the value found in step (i)(B).

(iii) The differences calculated in step (ii) represented that portion of the change in hearing that may be due to aging.

Example: Figure 1 shows in decibels the audiometric history of John Doe, a 32-year-old worker.

Figure 1

John Doe's age	Audiometric test frequency (Hz)				
	1000	2000	3000	4000	6000
26	10	5	5	10	5
*27	0	0	0	5	5
28	0	0	0	10	5
29	5	0	5	15	5
30	0	5	10	20	10
31	5	10	20	15	15
*32	5	10	10	25	20

The audiogram at age 27 is considered the baseline since it shows the best hearing threshold levels. Asterisks have been used to identify the baseline and most recent audiogram. A threshold shift of 20 dB exists at 4000 Hz between the audiograms taken at ages 27 and 32.

(The threshold shift is computed by subtracting the hearing threshold at age 27, which was 5, from the hearing threshold at age 32, which is 25.) A retest audiogram has confirmed this shift. The contribution of aging to this change in hearing may be estimated in the following manner:

Go to Tables F-1 and F-2 and find the age correction values (in dB) for 4000 Hz for a male at age 27 and age 32.

Figure 2

	Frequency (Hz)				
	1000	2000	3000	4000	6000
Age 32	6	5	7	10	14
Age 27	5	4	6	7	11
Difference	1	1	1	3	3

The difference shown in Figure 2 represents the amount of hearing loss that may be attributed to aging in the time period between the baseline audiogram and the most recent audiogram. In this example, the difference at 4000 Hz is 3 dB. This value is subtracted from the hearing level at 4000 Hz, which in the most recent audiogram is 25, yielding 22 after adjustment. Then the hearing threshold in the baseline audiogram at 4000 Hz (5) is subtracted from the adjusted annual audiogram hearing threshold at 4000 Hz (22). Thus the age-corrected threshold shift would be 17 dB (as opposed to a threshold shift of 20 dB without age correction).

Tables F-1 and F-2
Age Correction Values in:

Males						Females				
Audiometric Test Frequencies (Hz)					Age	Audiometric Test Frequencies (Hz)				
1000	2000	3000	4000	6000		1000	2000	3000	4000	6000
5	3	4	5	8	20 or younger	7	4	3	3	6
5	3	4	5	8	21	7	4	4	3	6
5	3	4	5	8	22	7	4	4	4	6
5	3	4	6	9	23	7	5	4	4	7
5	3	5	6	9	24	7	5	4	4	7
5	3	5	7	10	25	8	5	4	4	7
5	4	5	7	10	26	8	5	5	4	8
5	4	6	7	11	27	8	5	5	5	8
6	4	6	8	11	28	8	5	5	5	8
6	4	6	8	12	29	8	5	5	5	9
6	4	6	9	12	30	8	6	5	5	9
6	4	7	9	13	31	8	6	6	5	9
6	5	7	10	14	32	9	6	6	6	10
6	5	7	10	14	33	9	6	6	6	10
6	5	8	11	15	34	9	6	6	6	10
7	5	8	11	15	35	9	6	7	7	11
7	5	9	12	16	36	9	7	7	7	11
7	6	9	12	17	37	9	7	7	7	12
7	6	9	13	17	38	10	7	7	7	12
7	6	10	14	18	39	10	7	8	8	12
7	6	10	14	19	40	10	7	8	8	13
7	6	10	14	20	41	10	8	8	8	13
8	7	11	16	20	42	10	8	9	9	13
8	7	12	16	21	43	11	8	9	9	14
8	7	12	17	22	44	11	8	9	9	14
8	7	13	18	23	45	11	8	10	10	15
8	8	13	19	24	46	11	9	10	10	15
8	8	14	19	24	47	11	9	10	11	16
9	8	14	20	25	48	12	9	11	11	16
9	9	15	21	26	49	12	9	11	11	16
9	9	16	22	27	50	12	10	11	12	17
9	9	16	23	28	51	12	10	12	12	17
9	10	17	24	29	52	12	10	12	13	18
9	10	18	25	30	53	13	10	13	13	18
10	10	18	26	31	54	13	11	13	14	19
10	11	19	27	32	55	13	11	14	14	19
10	11	20	28	34	56	13	11	14	15	20
10	11	21	29	35	57	13	11	15	15	20
10	12	22	31	36	58	14	12	15	16	21
11	12	22	32	37	59	14	12	16	16	21
11	13	23	33	38	60 or older	14	12	16	17	22

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APPENDIX G
MONITORING NOISE LEVELS
(Non-Mandatory)

This appendix provides information to help employers comply with the noise monitoring obligations that are part of the hearing conservation amendment.

What is the purpose of noise monitoring?

This revised amendment requires that employees be placed in a hearing conservation program if they are exposed to average noise levels of 85 dB or greater during an 8 hour workday. In order to determine if exposures are at or above this level, it may be necessary to measure or monitor the actual noise levels in the workplace and to estimate the noise exposure or "dose" received by employees during the workday.

When is it necessary to implement a noise monitoring program?

It is not necessary for every employer to measure workplace noise. Noise monitoring or measuring must be conducted only when exposures are at or above 85 dB. Factors which suggest that noise exposures in the workplace may be at this level include employee complaints about the loudness of noise, indications that employees are losing their hearing, or noisy conditions which make normal conversation difficult. The employer should also consider any information available regarding noise emitted from specific machines. In addition, actual workplace noise measurements can suggest whether or not a monitoring program should be initiated.

How is noise measured?

Basically, there are two different instruments to measure noise exposures: the sound level meter and the dosimeter. A sound level meter is a device that measures the intensity of sound at a given moment. Since sound level meters provide a measure of sound intensity at only one point in time, it is generally necessary to take a number of measurements at different times during the day to estimate noise exposure over a workday. If noise levels fluctuate, the amount of time noise remains at each of the various measured levels must be determined.

To estimate employee noise exposures with a sound level meter it is also generally necessary to take several measurements at different locations within the workplace. After appropriate sound level meter readings are obtained, people sometimes draw "maps" of the sound levels within different areas of the workplace. By using a sound level "map" and information on employee locations throughout the day, estimates of individual exposure levels can be developed. This measurement method is generally referred to as *area* noise monitoring.

A dosimeter is like a sound level meter except that it stores sound level measurements and integrates these measurements over time, providing an average noise exposure reading for a given period of time, such as an 8-hour workday. With a dosimeter, a microphone is attached to the employee's clothing and the exposure measurement is simply read at the end of the desired time period. A reader may be used to read out the dosimeter's measurements. Since the dosimeter is worn by the employee, it measures noise levels in those locations in which the employee travels. A sound level meter can also be positioned within the immediate vicinity of the exposed worker to obtain an individual exposure estimate. Such procedures are generally referred to as *personal* noise monitoring.

Area monitoring can be used to estimate noise exposure when the noise levels are relatively constant and employees are not mobile. In workplaces where employees move about in different areas or where the noise intensity tends to fluctuate over time, noise exposure is generally more accurately estimated by the personal monitoring approach.

In situations where personal monitoring is appropriate, proper positioning of the microphone is necessary to obtain accurate measurements. With a dosimeter, the microphone is generally located on the shoulder and remains in that position for the entire workday. With a sound level meter, the microphone is stationed near the employee's head, and the instrument is usually held by an individual who follows the employee as he or she moves about.

Manufacturer's instruction, contained in dosimeter and sound level meter operating manuals, should be followed for calibration and maintenance. To ensure accurate results, it is considered good professional practice to calibrate instruments before and after each use.

How often is it necessary to monitor noise levels?

The amendment requires that when there are significant changes in machinery or production processes that may result in increased noise levels, remonitoring must be conducted to determine whether additional employees need to be included in the hearing conservation program. Many companies choose to remonitor periodically (once every year or two) to ensure that all exposed employees are included in their hearing conservation programs.

Where can equipment and technical advice be obtained?

Noise monitoring equipment may be either purchased or rented. Sound level meters cost about $500 to $1,000, while dosimeters range in price from about $750 to $1,500. Smaller companies may find it more economical to rent equipment rather than to purchase it. Names of equipment suppliers may be found in the telephone book (Yellow Pages) under headings such as: "Safety Equipment," "Industrial Hygiene," or "Engineers—Acoustical." In addition to providing information on obtaining noise monitoring equipment, many companies and individuals included under such listings can provide professional advice on how to conduct a valid noise monitoring program. Some audiological testing firms and industrial hygiene firms also provide noise monitoring services. Universities with audiological, industrial hygiene, or acoustical engineering departments may also provide information or may be able to help employers meet their obligations under this amendment.

Free, on-site assistance may be obtained from OSHA-supported state and private consultation organizations. These safety and health consultative entities give priority to the needs of small businesses.

Editor's Note: For a listing of organizations providing on-site assistance, we suggest you contact your local OSHA office, your state's occupational safety and health agency, or write to OSHA Reference Manual Project Manager at The Merritt Company, P.O. Box 955, Santa Monica, CA 90406.

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APPENDIX H
AVAILABILITY OF REFERENCED DOCUMENTS

Paragraphs (c) through (s) of 29 CFR 1910.95 and the accompanying appendices contain provisions which incorporate publications by reference. Generally, the publications provide criteria for instruments to be used in monitoring and audiometric testing. These criteria are intended to be mandatory when so indicated in the applicable paragraphs of Section 1910.95 and appendices.

It should be noted that OSHA does not require that employers purchase a copy of the referenced publications. Employers, however, may desire to obtain a copy of the referenced publications for their own information.

The designation of the paragraph of the standard in which the referenced publications appear, the titles of the publications, and the availability of the publications are as follows:

Paragraph designation	Referenced publication	Available from—
§ 1910.95(g)(1)(i)	"Specification for Personal Noise Dosimeters," ANSI S1.25-1978, (ASA 25-1978)	Back Numbers Department, Dept STD, American Institute of Physics 333 E 45th St., New York, NY 10017, American National Standards Institute, Inc., 1430 Broadway, New York, N Y 10018
§ 1910.95(g)(1)(ii)	"Specification for Sound Level Meters," S1.4-1971 (R 1976)	American National Standards Institute, Inc , 1430 Broadway, New York, NY 10018
§ 1910 95(k)(2), appendix E	"Specifications for Audiometers," S3 6-1969	American National Standards Institute, Inc , 1430 Broadway, New York, NY 10018
Appendix D	"Specification for Octve, Half-Octave and Third-Octave Band Filter Sets," S1.11-1971 (R1976)	Back Numbers Department, Dept STD, American Institute of Physics 333 E 45th St , New York, NY 10017, American National Standards Institute, Inc , 1430 Broadway, New York, N.Y 10018
Appendix G	"List of Personal Hearing Protectors and Attenuation Data," HEW Pub No 76-120, 1975	Superintendent of Documents, U S Government Printing Office, Washington, D C 20404

The referenced publications (or a microfiche of the publications) are available for review at many universities and public libraries throughout the country. These publications may also be examined at the OSHA Technical Data Center, Room N2439, United States Department of Labor, 200 Constitution Avenue N.W., Washington, D.C. 20210, (202) 523–9700 or at any OSHA Regional Office (see telephone directories under United States Government—Labor Department).

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APPENDIX I
DEFINITIONS

These definitions apply to the following terms as used in paragraphs (c) through (n) of CFR 1910.95.

Action level. An 8-hour time-weighted average of 85 decibels measured on the A-scale, slow response, or equivalently, a dose of fifty percent.

Audiogram. A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.

Audiologist. A professional specializing in the study and rehabilitation of hearing, who is certified by the American Speech-Language-Hearing Association or licensed by a state board of examiners.

Baseline audiogram. The audiogram against which future audiograms are compared.

Criterion sound level. A sound level of 90 decibels.

Decibel (dB). Unit of measurement of sound level.

Hertz (Hz). Unit of measurement of frequency, numerically equal to cycles per second.

Medical pathology. A disorder or disease. For purposes of this regulation, a condition or disease affecting the ear, which should be treated by a physician specialist.

Noise dose. The ratio, expressed as a percentage, of (1) the time integral, over a stated time or event, of the 0.6 power of the measured SLOW exponential time-averaged, squared A-weighted sound pressure and (2) the product of the criterion duration (8 hours) and the 0.6 power of the squared sound pressure corresponding to the criterion sound level (90 dB).

Noise dosimeter. An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.

Otolaryngologist. A physician specializing in diagnosis and treatment of disorders of the ear, nose and throat.

Representative exposure. Measurements of an employee's noise dose or 8-hour time-weighted average sound level that the employers deem to be representative of the exposures of other employees in the workplace.

Sound level. Ten times the common logarithm of the ratio of the square of the measured A-weighted sound pressure to the square of the standard reference pressure of 20 micropascals. Unit: decibels (dB). For use with this regulation, SLOW time response, in accordance with ANSI S1.4-1971 (R1976), is required.

Sound level meter. An instrument for the measurement of sound level.

Time-weighted average sound level. That sound level, which if constant over an 8-hour exposure, would result in the same noise dose as is measured.

APPENDIX J
1910.95 OCCUPATIONAL NOISE EXPOSURE

Hearing Loss:

OSHA will issue citations to employers for failing to record work related shifts in hearing of an average of 25 dB or more at 2000, 3000, and 4000 hertz (Hz) in either ear on the OSHA 200 log.

Employers are presently required by 29 CFR 1910.95 to inform employees in writing within 21 days of the determination of a Standard Threshold Shift (an average of 10 dB or more at 2000, 3000 and 4000 Hz in either ear) and to conduct specific follow-up procedures as required in paragraph (g) of the standard. Employers should be encouraged to use this information as a tracking tool for focusing noise reduction and hearing protection efforts.

Upper Extremity Cumulative Trauma Disorders (CTDs):
(excludes back cases)

OSHA will issue citations to employers for failing to record work related CTDs on the OSHA 200 log that are evidenced by:

- at least one physical finding, (i.e., an objective symptom);

OR

- a subjective symptom coupled with either medical treatment or lost workdays, (i.e., days away from work and/or days of restricted work activity).

OVERVIEW: SUBPART H

HAZARDOUS MATERIALS

This part relates to the safe handling of hazardous materials, including compressed gases; flammable and combustible liquids; spray finishing; dip tank operations; explosives and blasting agents; liquefied petroleum (LP) gas; anhydrous ammonia; and hazardous waste.

Sections 1910.101—.105 cover the safe handling, use, and storage of compressed gases. The requirements for acetylene (1910.102) apply to cylinder and pipe use as well as acetylene manufacture and cylinder charging.

Hydrogen requirements (1910.103) apply to the installation, design, and location of hydrogen gas systems on plant premises when the hydrogen supply is delivered by mobile equipment from off-plant premises. The design and location of liquefied hydrogen systems are also covered. Excluded are hydrogen manufacturing and supplying establishments, small hyrogen systems, and small portable containers of liquefied hydrogen.

The installation of bulk oxygen systems at industrial plants or institutions is addressed in 1910.104. Excluded are oxygen manufacturing and supplying establishments and small bulk oxygen systems. Design requirements for nitrous oxide piping systems are outlined in section 1910.105.

Section 1910.106 applies to any establishment handling flammable and combustible liquids. This part covers the handling, storage, and use of all flammable and combustible liquids having flashpoints below 200°F. Specific requirements for service stations; and refineries, chemical plants, and distilleries are covered. Excluded are: bulk transport of flammable and combustible liquids; fuel oil storage, handling, and use; flammable liquids without flashpoints; mists, sprays, and foams (except flammable aerosols); and installations that meet the requirements of NFPA #32-1970 (Dry Cleaning Plants), NFPA #35-1970 (Manufacture of Organic Coatings), NFPA #36-1967 (Solvent Extraction Plants), or NFPA #37-1970 (Installation and Use of Stationary Combustion Engines and Gas Turbines).

Spray finishing requirements (1910.107) apply to all establishments using flammable and combustible liquids or powders (including fluidized beds) for spray finishing. Excluded are: outdoor spray finishing (of buildings, etc.) and small, portable spraying equipment that is not repeatedly used in the same area. Dip tank requirements (1910.108) apply to dip tanks used for coating, finishing, treating, etc.

Section 1910.109 covers the storage, handling, transportation, and use of explosives, blasting agents, and pyrotechnics (fireworks). This part excludes the sale and display of pyrotechnics, and the use of explosives in accordance with the U.S. Pharmacopeia. Included are: gels and slurries; ammonium nitrate; and small arms ammunition, primers, and propellants (except manufacturer-related storage and transportation).

The LP gas standard (1910.110) covers the storage, handling, and use of LP gas, including use with commercial vehicles, use as motor fuel, and use in service stations. This part excludes LP gas in marine and pipeline terminals; natural gas plants; low pressure piping systems; residential and commercial appliances; and LP gas used with oxygen.

The storage and handling of anhydrous ammonia, including use in refrigerated storage systems, is covered by 1910.111. This part excludes ammonia manufacturers and refrigeration plants that use ammonia only as a refrigerant.

The process safety management of highly hazardous chemicals standard (1910.119) requires employers to implement safety management practices that protect workers from the consequences of chemical accidents.

The final rule on hazardous waste operations (1910.120) was added to protect workers at hazardous waste sites, including workers who respond to hazardous substance emergencies. This rule was mandated by Congress in the Superfund reauthorization and provides employee protection during initial site characterization and analysis, monitoring activities, materials handling activities, training, and emergency response.

This guide below lists the specific standards and where they may be found in the checklists.

This guide should help you determine which aspects of your operation are covered by this Subpart.

Std. No. **Page No.**

1910.101 **Compressed gases—general requirements** .... (H-01)

1910.102 **Acetylene** .... (H-01)

1910.103 **Hydrogen** .... (H-01)

1910.104 **Oxygen** .... (H-06)

1910.105 **Nitrous oxide** .... (H-08)

1910.106 **Flammable and combustible liquids** .... (H-09)

1910.107 **Spray finishing using flammable and combustible materials** .... (H-30)

1910.108 **Dip tanks containing flammable or combustible liquids** .... (H-37)

1910.109 **Explosives and blasting agents** .... (H-41)

1910.110 **Storage and handling of liquefied petroleum gases** .... (H-53)

1910.111 **Storage and handling of anhydrous ammonia** .... (H-79)

1910.119 **Process safety management of highly hazardous chemicals** .... (H-88)

1910.120 **Hazardous waste operations and emergency response** .... (H-93)

GENERAL DEFINITIONS — SUBPART H

Approved. Listed, or approved by the following nationally recognized testing laboratories: Underwriters' Laboratories, Inc., and Factory Mutual Engineering Corp.

DOT container. A container constructed in accordance with the applicable requirements of 49 CFR Chapter I.

DOT cylinders. Cylinders meeting the requirements of 49 CFR Chapter I.

DOT Specifications. Regulations of the Department of Transportation published in 49 CFR Chapter I.

Listed. See "approved."

Definitions applicable to 1910.101-.105, Compressed gases:

ASME. American Society of Mechanical Engineers.

Bulk oxygen system. An assembly of equipment, such as oxygen storage containers, pressure regulators, safety devices, vaporizers, manifolds, and interconnecting piping, which has storage capacity of more than 13,000 cubic feet of oxygen, Normal Temperature and Pressure (NTP), connected in service or ready for service, or more than 25,000 cubic feet of oxygen (NTP) including unconnected reserves on hand at the site.

Gaseous hydrogen system. One in which the hydrogen is delivered, stored and discharged in the gaseous form to consumer's piping. The system includes stationary or movable containers, pressure regulators, safety relief devices, manifolds, interconnecting piping and controls.

Definitions applicable to 1910.106, Flammable liquids:

Aerosol. A material which is dispensed as a mist, spray, or foam by a propellant under pressure.

Atmospheric tank. A storage tank designed to operate at pressures from atmospheric through 0.5 p.s.i.g.

Automotive service station. Where flammable or combustible liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles including any facilities available for the sale and service of tires, batteries, and accessories, and for minor automotive maintenance work.

Barrel. A volume of 42 U.S. gallons.

Basement. A story of a building or structure having one-half or more of its height below ground level.

Boiling point. The boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.).

Boilover. The expulsion of crude oil (or certain other liquids) from a burning tank.

Bulk plant. Where flammable or combustible liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distribution by similar conveyances or containers.

Chemical plant. A large integrated plant or portion of a plant other than a refinery or distillery where flammable or combustible liquids are produced or used in chemical reactions.

Closed container. A container so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures.

Combustible liquid. Any liquid having a flashpoint at or above 100°F. (37.8°C.). Combustible liquids are divided into two classes as follows:

> **Class II liquids** include those with flashpoints at or above 100°F. (37.8°C.) and below 140°F. (60°C.) except any mixture having components with flashpoints of 200°F. (93.3°C.) or higher, the volume of which make up 99% or more of the total volume of the mixture.
>
> **Class III liquids** include those with flashpoints at or above 140°F (60°C.), and below 200°F. (93.3°C.), except any mixture having components with flashpoints of 200°F. (93.3°C.), or higher, the total volume of which make up 99% or more of the total mixture.
>
> **Class IIIA liquids** include those with flashpoints at or above 140°F. (60°C.) and below 200°F. (93.3°C.), except any mixture having components with flashpoints of 200°F. (93.3°C.), or higher, the total volume of which make up 99% or more of the total mixture.
>
> **Class IIIB liquids** include those with flashpoints at or above 200°F. (93.3°C.). This section does not cover Class IIIB liquids. Where the term "Class III liquids" is used in this section, it shall mean only Class IIIA liquids.

Note: When a combustible liquid is heated for use to within 30°F.(16.7°C.) of its flashpoint, it shall be handled in accordance with the requirements for the next lower class of liquids.

Container. Any can, barrel, or drum.

Crude petroleum. Hydrocarbon mixtures that have a flash point below 150°F. and which have not been processed in a refinery.

Distillery. A plant or portion of a plant where flammable or combustible liquids produced by fermentation are concentrated, and where the concentrated products may also be mixed, stored, or packaged.

Fire area. An area of a building separated from the remainder of the building by construction having a fire resistance of at least 1 hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least 1 hour.

Flammable aerosol. An aerosol which is required to be labeled "Flammable" under the Federal Hazardous Substances Labeling Act (15 U.S.C. 1261).

Flammable liquid. Any liquid having a flashpoint below 100°F. (37.8°C.), except any mixture having components with flashpoints of 100°F. (37.8°C.) or higher, the total of which make up 99% or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

> **Class IA** includes liquids having flashpoints below 73°F. (22.8°C.) and having a boiling point below 100°F. (37.8°C.)
>
> **Class IB** includes liquids having flashpoints below 73°F. (22.8°C.) and having a boiling point at or above 100°F. (37.8°C.).
>
> **Class IC** includes liquids having flashpoints at or above 73°F. (22.8°C.)and below 100°F. (37.8°C.).

Flashpoint. The minimum temperature at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Institutional occupancy. The occupancy or use of a building or structure or any portion thereof by persons harbored or detained to receive medical, charitable or other care or treatment, or by persons involuntarily detained.

Liquid. Any material which has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM Test for Penetration for Bituminous Materials, D-5-65. When not otherwise identified, the term liquid shall include both flammable and combustible liquids.

Low pressure tank. A storage tank which has been designed to operate at pressures above 0.5 p.s.i.g. but not more than 15 p.s.i.g.

Marine service station. Where flammable or combustible liquids used as fuels are stored and dispensed from fixed equipment on shore, piers, wharves, or floating docks into the fuel tanks of self-propelled craft, including all facilities used in connection therewith.

Portable tank. A closed container having a liquid capacity over 60 U.S. gallons and not intended for fixed installation.

Pressure vessel. A storage tank or vessel which has been designed to operate at pressures above 15 p.s.i.g.

Protection for exposure. Adequate fire protection for structures on property adjacent to tanks, where there are employees of the establishment.

Refinery. A plant in which flammable or combustible liquids are produced on a commercial scale from crude petroleum, natural gasoline, or other hydrocarbon sources.

Safety can. An approved container, of not more than 5 gallons capacity, having a spring-closing lid and spout cover to safely relieve internal pressure when subjected to fire exposure.

SUS. Saybolt Universal Seconds as determined by the Standard Method of Test for Saybolt Viscosity (ASTM D-88-56).

Unstable (reactive) liquid. A liquid which in the pure state or as commercially produced or transported will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature.

Vapor pressure. The pressure exerted by a volatile liquid.

Ventilation. For the prevention of fire and explosion, ventilation is considered adequate if it is sufficient to prevent accumulation of significant quantities of vapor-air mixtures in concentration over one-fourth of the lower flammable limit.

Viscous. Having a viscosity of 45 SUS or more.

Definitions applicable to 1910.107, Spray finishing using flammable and combustible materials:

Aerated solid powders. Any powdered material used as a coating material which shall be fluidized within a container by passing air uniformly from below.

Dry spray booth. A spray booth not equipped with a water washing system.

Electrostatic fluidized bed. A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material which is electrically charged with a charge opposite to the charge of the object to be coated; such object is transported through the container immediately above the charged and aerated materials in order to be coated.

Fluidized bed. A container holding powder coating material which is aerated from below so as to form an air-supported expanded cloud of such material through which the preheated object to be coated is immersed and transported.

Spray booth. A power-ventilated structure to enclose or accommodate a spraying operation to confine and limit escape of spray, vapor, and residue, and to safely conduct them to an exhaust system.

Spraying area. Any area in which dangerous quantities of flammable vapors or mists, or combustible residues, dusts, or deposits are present due to the operation of spraying processes.

Waterwash spray booth. A spray booth equipped with a water washing system designed to minimize dusts or residues entering exhaust ducts and to permit the recovery of overspray finishing material.

Definitions applicable to 1910.108, Dip tanks containing flammable or combustible liquids:

Dip tank. A tank, vat, or container of flammable or combustible liquid in which articles or materials are immersed for the purpose of coating, finishing, treating, or similar processes.

Vapor area. Any area containing dangerous quantities of flammable vapors in the vicinity of dip tanks, their drainboards or associated drying, conveying, or other equipment, during operation or shutdown periods.

Definitions applicable to 1910.109, Explosives and blasting agents:

Blasting agent. Any material or mixture, consisting of a fuel and oxidizer, intended for blasting, not otherwise classified as an explosive and in which none of the ingredients are classified as an explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined.

Explosive. Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, unless such compound, mixture, or device is otherwise specifically classified by the U.S. Department of Transportation. The term "explosives" shall include all material which is classified as Class A, Class B, and Class C explosives by the U.S. Department of Transportation, and includes, but is not limited to dynamite, black powder, pellet powders, initiating explosives, blasting caps, electric blasting caps, safety fuse, fuse lighters, fuse igniters, squibs, cordeau detonant fuse, instantaneous fuse, igniter cord, igniters, small arms ammunition, small arms ammunition primers, smokeless propellant, cartridges for propellant-actuated power devices, and cartridges for industrial guns. Commerical explosives are those explosives which are intended to be used in commercial or industrial operations.

Class A explosives. Possessing detonating, or otherwise maximum hazard.

Class B explosives. Possessing flammable hazard.

Class C explosives. Certain types of manufactured articles which contain Class A or Class B explosives, or both, as componenets but in restricted quantities.

Explosive-actuated power devices. Any tool or special mechanized device which is actuated by explosives, but not including propellant-actuated power devices.

Forbidden or not acceptable explosives. Explosives which are forbidden or not acceptable for transportation by common carriers by rail freight, rail express, highway, or water in accordance with the regulations of the U.S. Department of Transportation, 49 CFR Chapter I.

Magazine. Any building or structure, other than an explosives manufacturing building, used for the storage of explosives.

Propellant-actuated power devices. Any tool or special mechanized device or gas generator system which is actuated by a smokeless propellant or which releases and directs work through a smokeless propellant charge.

Pyrotechnics. Any combustible or explosive compositions or manufactured articles designed and prepared for the purpose of producing audible or visible effects which are commonly referred to as fireworks.

Semiconductive hose. Hose with an electrical resistance high enough to limit flow of stray electric currents to safe levels, yet not so high as to prevent drainage of static electric charges to ground.

Small arms ammunition. Any shotgun, rifle, pistol, or revolver cartridge, and cartridges for propellant-actuated power devices and industrial guns. Military-type ammunition containing explosive-bursting charges, incendiary, tracer, spotting, or pyrotechnic projectiles is excluded from this definition.

Small arms ammunition primers. Small percussion-sensitive explosive charges, encased in a cup, used to ignite propellant powder.

Smokeless propellants. Solid propellants, commonly called smokeless powders in the trade, used in small arms ammunition, cannon, rockets, propellant-actuated power devices, etc.

Special industrial explosives devices. Explosive-actuated power devices and propellant-actuated power devices.

Special industrial explosives materials. Shaped materials, sheet forms and various other extrusions, pellets, and packages of high explosives, which include dynamite, trinitrotoluene (TNT), pentaerythritol tetranitrate (PETN), hexahydro-1,3,5-trinitro-s-triazine (RDX), and other similar compounds used for high-energy-rate forming, expanding, and shaping in metal fabrication, and for dismemberment and quick reduction of scrap metal.

Water gels and slurry explosives. These comprise a wide variety of materials used for blasting. They all contain substantial proportions of water and high proportions of ammonium nitrate, some of which is in solution in the water. Two broad classes of water gels are (i) those which are sensitized by a material classed as an explosive, such as TNT or smokeless powder, (ii) those which contain no ingredient classified as an explosive; these are sensitized with metals such as aluminum or with other fuels. Water gels may be premixed at an explosives plant or mixed at the site immediately before delivery into the borehole.

Definitions applicable to 1910.110, Storage and handling of liquefied petroleum gases:

API-ASME container. A container constructed in accordance with the requirements of paragraph (b)(3)(iii) of this section (page H-53).

ASME container. A container constructed in accordance with the requirements of paragraph (b)(3)(i) of this section (page H-53).

Container assembly. An assembly consisting essentially of the container and fittings for all container openings, including shutoff valves, excess flow valves, liquid-level gaging devices, safety relief devices, and protective housing.

Containers. All vessels, such as tanks, cylinders, or drums, used for transportation or storing liquefied petroleum gases.

Liquefied petroleum gases (LPG and LP-Gas). Any material which is composed predominantly of any of the following hydrocarbons, or mixtures of them; propane, propylene, butanes (normal butane or iso-butane), and butylenes.

Movable fuel storage tenders or farm carts. Containers not in excess of 1,200 gallons water capacity, equipped with wheels to be towed from one location of usage to another. They are used as fuel supply for farm tractors, construction machinery and similar equipment.

P.S.I.A. —Pounds per square inch absolute.

P.S.I.G. —Pounds per square inch gauge.

Systems. An assembly of equipment consisting essentially of the container or containers, major devices such as vaporizers, safety valves, excess flow valves, regulators, and piping connecting such parts.

Vaporizer-burner. An integral vaporizer-burner unit, dependent upon the heat generated by the burner as the source of heat to vaporize the liquid used for dehydrators or dryers.

Ventilation, adequate. When specified for the prevention of fire during normal operation, ventilation shall be considered adequate when the concentration of the gas in a gas-air mixture does not exceed 25% of the lower flammable limit.

Definitions applicable to 1910.111, Storage and handling of anhydrous ammonia:

Appurtenances. All devices such as pumps, compressors, safety relief devices, liquid-level gaging devices, valves and pressure gages.

Capacity. Total volume of the container in standard U.S. gallons.

Code. The Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels of the American Society of Mechanical Engineers (ASME) — 1968.

Container. All vessels, tanks, cylinders, or spheres used for transportation, storage, or application of anhydrous ammonia.

Cylinder. A container of 1,000 pounds of water capacity or less constructed in accordance with Department of Transportation specifications.

Design pressure. Identical to the term "Maximum Allowable Working Pressure" used in the Code.

Farm vehicle. A vehicle for use on a farm on which is mounted a container of not over 1,200 gallons water capacity.

Filing density. The percent ratio of the weight of the gas in a container to the weight of water at 60°F. that the container will hold.

Gas. Anhydrous ammonia in either the gaseous or liquefied state.

Gas mask. Gas masks approved by the Bureau of Mines, U.S. Department of the Interior.

Definitions applicable to 1910.119, Process safety management of highly hazardous chemicals:

Atmospheric tank. A storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g. (pounds per square inch gauge, 3.45 Kpa).

Boiling point. The boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.). For the purposes of this section, where an accurate boiling point is unavailable for the material in question, or for mixtures that do not have a constant boiling point, the 10 percent point of a distillation performed in accordance with the Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62, may be used as the boiling point of the liquid.

Catastrophic release. A major uncontrolled emission, fire or explosion involving one or more highly hazardous chemicals, that presents serious danger to employees in the workplace.

Facility. The buildings, containers or equipment which contain a process.

Highly hazardous chemical. A substance possessing toxic, reactive, flammable or explosive properties and specified by paragraph (a)(1) of this section.

Hot work. Work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.

Normally unoccupied remote facility. A facility which is operated, maintained or serviced by employees who visit the facility only periodically to check its operation and to perform necessary operating or maintenance tasks. No employees are permanently stationed at the facility. Facilities meeting this definition are not contiguous with, and must be geographically remote from all other buildings, processes or persons.

Process. Any activity involving a highly hazardous chemical including any use, storage, manufacturing, handling, or the on-site movement of such chemicals, or combination of these activities. For purposes of this definition, any group of vessels which are interconnected and separate vessels which are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.

Replacement in kind. A replacement which satisfies the design specification.

Trade secret. Any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Appendix D contained in 1910.1200 sets out the criteria to be used In evaluating trade secrets.

Definitions applicable to 1910.120, Hazardous waste operations and emergency response:

Buddy system. Organizing employees into work groups so that each employee is designated to observe the activities of at least one other employee in the work group. The purpose of the buddy system is to provide quick assistance to those other employees in the event of an emergency.

Clean-up operation. An operation where hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared-up, or in any other manner processed or handled with the ultimate goal of making the site safer for people or the environment.

Decontamination. The removal of hazardous substances from employees and their equipment to the extent necessary to prevent adverse health effects.

Emergency response. Response to any occurrence which results, or is likely to result, in a release of a hazardous substance due to an unforeseen event.

Established permissible exposure limit. The inhalation or dermal permissible exposure limit specified in Subpart Z. If none is specified, then use either the exposure limits in "NIOSH Recommendations for Occupational Health Standards," the standards specified by the ACGIH in their publication "Threshold Limit Values and Biological Exposure Indices for 1986-87," or a limit based upon a published study or manufacturers' MSDS. The NIOSH publication may be ordered by calling (513) 533-8236, and the ACGIH publication at (513) 661-7881.

Facility. Any building, structure, installation, equipment, pipe or pipeline, well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft; or any site where a hazardous substance has been deposited, stored, disposed of, or placed (excluding any consumer product in consumer use or any water-borne vessel).

Hazardous materials response (HAZMAT). An organized group of employees who perform work to handle and control actual or potential leaks or spills of hazardous substances.

Hazardous substance. Any substance designated or listed below, to which exposure results or may result in adverse safety or health effects:

> Any substance defined under section 101(14) of CERCLA; Any biological agent and other disease causing agent as defined in section 104(33) of CERCLA;
>
> Any substance listed by the Department of Transportation and regulated as hazardous materials under 49 CFR 172.101 and appendices; and
>
> Hazardous waste.

Hazardous waste. A waste or combination of wastes as defined in 40 CFR 261.3 (EPA); or those substances defined as hazardous waste in 49 CFR 171.8 (DOT).

Hazardous waste operation. Any operation conducted within the scope of this standard.

Hazardous waste site. Any facility or location at which hazardous waste operations within the scope of this standard take place.

Health hazard. A chemical, mixture of chemicals, or a pathogen for which there is statistically significant evidence that acute or chronic health effects may occur in exposed employees. This includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucuous membranes. Further definition of these terms can be found in Appendix A to the hazard communication standard (Subpart Z, 1910.1200).

IDLH or Immediately dangerous to life or health. Any condition that poses an immediate threat to life, or which is likely to result in acute or immediate severe health effects. This includes oxygen deficiency conditions.

Oxygen deficiency. That concentration of oxygen by volume below which air supplying respiratory protection must be provided. It exists in atmospheres where the percentage of oxygen is less than 19.5%.

Post emergency response. That portion of an emergency response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the site has begun. If this function is performed by employees who were involved in the initial emergency response, then it is considered to be part of the initial emergency response and not the post emergency response. If this function is performed by employees separate from the initial response group, then it is considered a post emergency response and subject to paragraph (g)(11) of this section.

Qualified person. A person with specific training, knowledge, and experience in the area which the person has responsibility and authority to control.

Site safety and health official. The individual on a hazardous site who is responsible to the employer and has the authority and knowledge necessary to implement the site safety and health plan and verify compliance with applicable safety and health requirements.

Small quantity generator. A generator of hazardous wastes who in any calendar month generates no more than 1,000 kilkograms (2,205 pounds) of hazardous waste in that month.

Uncontrolled hazardous waste site. An area where an accumulation of hazardous waste creates a threat to the health and safety of individuals and/or the environment. Examples include surface impoundments, landfills, dumps, and tank or drum farms. Normal operations at treatment, storage and disposal (TSD) sites are not covered by this definition.

	YES	NO
1910.101 – COMPRESSED GASES – GENERAL REQUIREMENTS		
(a) Inspection of Compressed Gas Cylinders.		
Are gas cylinders visually examined to determine their safe condition? (a)		
Are visual and other inspections conducted as prescribed in the Hazardous Materials Regulations of the Department of Transportation (49 CFR Parts 171-179 and 14 CFR Part 103?) (a)		
Where these regulations are not applicable, are visual and other inspections conducted in accordance with Compressed Gas Association Pamphlets C-6-1968 and C-8-1962? (a)		
(b) Compressed Gases.		
Are the in-plant handling, storage, and utilization of all compressed gases in cylinders, portable tanks, rail tankcars, or motor vehicle cargo tanks in accordance with Compressed Gas Association Pamphlet P-1-1965? (b)		
(c) Safety Relief Device for Compressed Gas Retainers.		
Are compressed gas cylinders, portable tanks, and cargo tanks equipped with a pressure relief device, installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda, and S-1.2-1963? (c)		
1910.102 – ACETYLENE		
(a) Cylinders.		
Is the in-plant transfer, handling, storage, and utilization of acetylene in cylinders in accordance with Compressed Gas Association Pamphlet G-1-1966? (a)		
(b) Piped Systems.		
Are piping systems for the in-plant transfer and distribution of acetylene designed, installed, maintained, and operated in accordance with Compressed Gas Association Pamphlet G-1.3-1959? (b)		
(c) Generators and Filling Cylinders.		
Are plants for the generation of acetylene and the charging of acetylene cylinders designed, constructed, and tested in accordance with the standards prescribed in Compressed Gas Association Pamphlet G-1.4-1966? (c)		
1910.103 – HYDROGEN		
(a) General.		
The checklist for gaseous hydrogen systems applies to the installation of gaseous hydrogen systems on consumer premises, where the hydrogen supply to the consumer premises originates outside the consumer premises and is delivered by mobile equipment. (a)		
This section **does not** apply to gaseous hydrogen systems that have a total hydrogen content of less than 400 cubic feet, nor to hydrogen manufacturing plants or other establishments operated by the hydrogen supplier or his agent for the purpose of storing hydrogen and refilling portable containers, trailers, mobile supply trucks, or tank cars. (a)		

	YES	NO
1910.103 – HYDROGEN **(a) General.**		
(b) Gaseous Hydrogen Systems.		
Containers. (b)(1)(i) Do hydrogen containers comply with one of the following: *(1)* Are they designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VIII – Unfired Pressure Vessels-1968; or		
(2) Are they designed, constructed, tested and maintained in accordance with U.S. Department of Transportation Specifications and Regulations? (b)(1)(i)		
Are permanently installed containers provided with substantial non-combustible supports on firm noncombustible foundations? (b)(1)(b)		
Is each portable container legibly marked with the name "Hydrogen" in accordance with "Marking Portable Compressed Gas Containers to Identify the Material Contained", ANSI Z48.1-1954? (b)(1)(c)		
Is each manifolded hydrogen supply unit legibly marked with the name Hydrogen or a legend such as "This Unit Contains Hydrogen."? (b)(1)(c)		
Are hydrogen containers equipped with safety relief devices as required by the ASME Boiler and Pressure Vessel Code, or the DOT Specifications and Regulations under which the container is fabricated? (b)(1)(ii)(a)		
Are safety relief devices arranged to discharge upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container, adjacent structure or personnel? (b)(1)(ii)(b) NOTE: This requirement does not apply to DOT Specification containers having an internal volume of 2 cubic feet or less.		
Are safety relief devices or vent piping designed or located so that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device? (b)(1)(ii)(c)		
Are piping, tubing, and fittings suitable for hydrogen service and for the pressures and temperatures involved? (b)(1)(iii)(a)		
Is the use of cast iron pipe and fittings prohibited? (b)(1)(iii)(a)		
Does piping and tubing conform to Section 2, "Industrial Gas and Air Piping," Code for Pressure Piping, ANSI B31.1-1967 with addenda B31.1-1969? (b)(1)(iii)(b)		
Are joints in piping and tubing made by welding or brazing or by use of flanged, threaded, socket, or compression fittings? (b)(1)(iii)(c)		
Are gaskets and thread sealants suitable for hydrogen service? (b)(1)(iii)(c)		
Are valves, gauges, regulators and other accessories suitable for hydrogen service? (b)(1)(iv)(a)		
Is the installation of hydrogen systems supervised by personnel familiar with proper practices with reference to their construction and use? (b)(1)(iv)(b)		

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(b) Gaseous Hydrogen Systems.

	YES	NO
Are storage containers, piping, valves, regulating equipment, and other accessories readily accessible, and are they protected against physical damage and against tampering? (b)(1)(iv)(c)		
Are cabinets or housings containing hydrogen control or operating equipment adequately ventilated? (b)(1)(iv)(d)		
Is each mobile hydrogen supply unit used as part of a hydrogen system adequately secured to prevent movement? (b)(1)(iv)(e)		
Are mobile hydrogen supply units electrically bonded to the system before discharging hydrogen? (b)(1)(iv)(f)		
Is the hydrogen storage location permanently placarded as follows: "HYDROGEN – FLAMMABLE GAS – NO SMOKING – NO OPEN FLAMES," or equivalent? (b)(1)(v)		
After a system installation, are all piping, tubing, and fittings tested and proved hydrogen gas tight at the maximum operating pressure? (b)(1)(vi)		
Is the system located so that it is readily accessible to delivery equipment and to authorized personnel? (b)(2)(i)(a)		
Are all systems located aboveground? (b)(2)(i)(b)		
Are systems precluded from being located beneath electric power lines? (b)(2)(i)(c)		
Are systems so located that they are not close to flammable liquid piping or piping of other flammable gases? (b)(2)(i)(d)		
Are systems located near aboveground flammable liquid storage, so located so that they are on higher ground than the flammable liquid storage, except when dikes, diversion curbs, grading, or separating solid walls are used to prevent accumulation of flammable liquids under the system? (b)(2)(i)(e)		
Is the location of a system in accordance with Table H-1? (See Appendix.) (b)(2)(ii)(a)		
Is the minimum distance in feet from a hydrogen system of indicated capacity located outdoors, in separate buildings or in special rooms to any specified outdoor exposure in accordance with Table H-2? (See Appendix.) (b)(2)(ii)(b)		
NOTE: Items 1, and 3 to 10 inclusive, and 14, **do not** apply where protective structures such as adequate fire walls are located between the system and the exposure. (b)(2)(ii)(c)		
Are hydrogen systems of less than 3,000 CF located inside of buildings and exposed to other occupancies, situated in the building so that the system will comply with the following items:		
(1) Is the area adequately ventilated as required in Sec. 1910.103(b)(3)(ii)(b) below?		
(2) Is there at least 20 feet between the system and stored flammable materials or oxidizing gases maintained?		
(3) Is there at least 25 feet between the system and open flames, or ordinary electrical equipment or other sources of ignition maintained?		
(4) Is there at least 25 feet between the system and concentrations of people maintained?		
(5) Is at least 50 feet between the system and intakes of ventilation or air conditioning equipment and air compressors maintained?		

1910.103 – HYDROGEN

(b) Gaseous Hydrogen Systems.

	YES	NO
(6) Is there at least 50 feet and other flammable gas storage maintained?		
(7) Is the system protected against damage or injury due to falling objects or working activity in the area?		
(8) If more than one system of 3,000 CF or less is installed in the same area, is there at least 50 feet of separation between the systems, and does each system satisfy all of the above items? (b)(2)(ii)(d)		
In outdoor locations are protective walls or roofs provided, and are they constructed of noncombustible materials? (b)(3)(i)(a)		
In outdoor locations where the enclosing sides adjoin each other, is the area properly ventilated? (b)(3)(i)(b)		
In outdoor locations is the electrical equipment within 15 feet of the outdoor location, in accordance with subpart S of this part? (b)(3)(i)(c)		
Are separate buildings housing hydrogen systems built of at least noncombustible construction? (b)(3)(ii)		
Are windows and doors so located as to be readily accessible in case of emergency? (b)(3)(ii)(a)		
Are windows of glass or plastic in metal frames? (b)(3)(ii)(a)		
Is adequate ventilation to the outdoors provided? (b)(3)(ii)(b)		
Are the inlet openings for ventilation located near the floor in exterior walls only? (b)(3)(ii)(b)		
Are outlet openings for ventilation located at the high point of the room in exterior walls or roof? (b)(3)(ii)(b)		
Do inlet and outlet ventilation openings have a minimum total area of one (1) square foot per 1,000 CF of room volume? (b)(3)(ii)(b)		
Is the ventilation discharge from outlet openings directed or conducted to a safe location? (b)(3)(ii)(b)		
Is explosion venting provided in exterior walls or roof only? (b)(3)(ii)(c)		
Are the explosion venting areas equal to not less than 1 square foot per 30 CF of room volume, and does it consist of any one or any combination of the following:		
(1) Walls of light, noncombustible material, preferably single thickness, single strength glass?		
(2) Lightly fastened hatch covers?		
(3) Lightly fastened swinging doors in exterior walls opening outward?		
(4) Lightly fastened walls or roof designed to relieve at a maximum pressure of 25 pounds per square foot? (b)(3)(ii)(c)		
Are sources of ignition from open flames, electrical equipment, or heating equipment prohibited when a separate building is used for a hydrogen system? (b)(3)(ii)(d)		
Is all electrical equipment in accordance with subpart S of this part for Class I, Division 2 locations? (b)(3)(ii)(e)		
If heating is provided is it only by steam, hot water, or other indirect means? (b)(3)(ii)(f)		
Where special rooms are used for gaseous hydrogen systems, are the following complied with? (b)(3)(iii)		

1910.103 – HYDROGEN

(b) Gaseous Hydrogen Systems.

	YES	NO
Do floors, walls, and ceilings have a fire resistance rating of at least 2 hours? (b)(3)(iii)(a)		
Are walls or partitions continuous from floor to ceiling, and are they securely anchored? (b)(3)(iii)(a)		
Is at least one wall an exterior wall? (b)(3)(iii)(a)		
Are openings to other parts of the building prohibited? (b)(3)(iii)(a)		
Are windows and doors in exterior walls, and are they so located as to be readily accessible in case of emergency? (b)(3)(iii)(a)		
Are windows of glass or plastic in metal frames? (b)(3)(iii)(a)		
Is ventilation as provided in (ii)(b) above, provided? (b)(3)(iii)(b)		
Are the items in (3)(ii)(c) provided for explosion venting? (b)(3)(iii)(c)		
Are sources of ignition from open flames, electrical equipment, or heating equipment prohibited? (b)(3)(iii)(d)		
Is electrical equipment in accordance with Article 501 of the National Electrical Code, NFPA 70-1971, for Class I Division 2 locations? (b)(3)(iii)(e)		
If heating is provided, is it by means of steam, hot water, or indirect means? (b)(3)(iii)(f)		
Are legible instructions maintained at operating locations for installations which require any operation of equipment by the user? (b)(4)		
Is the equipment and functioning of each charged gaseous hydrogen system maintained in a safe operating condition in accordance with the requirements of this section? (b)(5)		
Is the area within 15 feet of any hydrogen container kept free of dry vegetation and combustible material? (b)(5)		

(c) Liquefied Hydrogen Systems.

The following items **do not** apply to liquefied hydrogen portable containers of less than 150 liters (39.63 gal.) capacity, nor to liquefied hydrogen manufacturing plants or other establishments operated by the hydrogen supplier or his agent, for the sole purpose of storing liquefied hydrogen and refilling portable containers, trailers, mobile supply trucks or tank cars. (c)

	YES	NO
Are storage containers designed, constructed, and tested in accordance with the appropriate requirements of the ASME Boiler and Pressure Vessel Code, Section VIII – Unfired Pressure Vessels (1968), or the applicable provisions of API Standard 620, Recommended Rules for Design and Construction of Large, Welded, Low-Pressure Storage Tanks, 2d Edition (June 1963) and Appendix R (April 1965)? (c)(1)(i)(a)		
Are portable containers designed, constructed and tested in accordance with Department of Transportation Specifications and Regulations? (c)(1)(i)(b)		
Are permanently installed containers provided with substantial noncombustible supports that are securely anchored on firm noncombustible foundations? (c)(1)(ii)		
Are steel supports in excess of 18 inches in height protected with a protective coating having a 2-hour fire-resistance rating? (c)(1)(ii)		

1910.103 – HYDROGEN

(c) Liquefied Hydrogen Systems.

	YES	NO
Is each container legibly marked to indicate: "LIQUEFIED HYDROGEN – FLAMMABLE GAS."? (c)(1)(iii)		
(1) Are stationary liquefied hydrogen containers equipped with safety relief devices fixed in accordance with CGA Pamphlet S-1, Part 3, Safety Relief Device Standards for Compressed Gas Storage Containers?		
(2) Are portable liquefied hydrogen containers complying with the U.S. Department of Transportation Regulations equipped with safety relief devices as required in the U.S. Department of Transportation Specifications and Regulations?		
Are safety relief devices sized in accordance with the requirements of CGA Pamphlet S-1, Safety Relief Device Standards, Part 1, Compressed Gas Cylinders and Part 2, Cargo and Portable Tank Containers? (c)(1)(iv)(a)		
Are safety relief devices so arranged to discharge unobstructed to the outdoors and in such a manner as to prevent impingement of escaping liquid or gas upon the container, adjacent structures or personnel? (c)(1)(iv)(b)		
Are safety relief devices or vent piping designed or located so that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device? (c)(1)(iv)(c)		
Are safety relief devices provided in piping wherever liquefied hydrogen could be trapped between closures? (c)(1)(iv)(d)		
Is piping, tubing, and fittings and gasket and thread sealants suitable for hydrogen service at the pressures and temperatures involved? (c)(1)(v)(a)		
Does gaseous hydrogen piping and tubing (above -20°F.) conform to the applicable sections of Pressure Piping Section 2 – Industrial Gas and Air Piping, ANSI B31.1-1967 with addenda B31.1-1969? (c)(1)(v)(b)		
Is the design of liquefied hydrogen or cold (-20° F. or below) gas piping in accordance with the requirements of Petroleum Refinery Piping ANSI B31.3-1966 or Refrigeration Piping ANSI B31.5-1966 with addenda B31.5a-1968? (c)(1)(v)(b)		
Are joints in piping and tubing made by welding or brazing as the preferred method? (c)(1)(v)(c)		
Are means provided to minimize exposure to personnel to piping operating at low temperatures? (c)(1)(v)(d)		
Are means provided to prevent air condensate from contacting piping, structural members, and surfaces not suitable for cryogenic temperatures? (c)(1)(v)(d)		
Are only insulating materials which are rated nonburning in accordance with ASTM Procedures D1692-68 used? (c)(1)(v)(d)		
Is such insulation designed to have a vapor-tight seal in the outer covering? (c)(1)(v)(d)		
Is the insulation material and outside shield of adequate design to prevent attrition of the insulation due to normal operating conditions? (c)(1)(v)(d)		

1910.103 – HYDROGEN
(c) Liquefied Hydrogen Systems.

	YES	NO
Is the installation of uninsulated piping and equipment which operate at liquefied-hydrogen temperature prohibited above asphalt surfaces or other combustible materials? (c)(1)(v)(e)		
Are valves, gauges, regulators, and other accessories suitable for liquefied hydrogen service, and for the pressures and temperatures involved? (c)(1)(vi)(a)		
Is the installation of liquefied hydrogen systems supervised by personnel familiar with proper practices and with reference to their construction and use? (c)(1)(vi)(b)		
Are storage containers, piping, valves, regulating equipment, and other accessories readily accessible, and are they protected against physical damage and against tampering? (c)(1)(vi)(c)		
Is there a shutoff valve located in liquid product withdrawal lines as close to the container as practical? (c)(1)(vi)(c)		
On containers of over 2,000 gallons capacity, is this shutoff valve of the remote control type with no connections, flanges, or other appurtenances allowed in the piping between the shutoff valve and its connection to the inner container? (c)(1)(vi)(c)		
Are cabinets or housings containing hydrogen control equipment ventilated to prevent any accumulation of hydrogen gas? (c)(1)(vi)(c)		
After installation, is all field-erected piping tested and proved hydrogen gastight at operating pressure and temperature? (c)(1)(vii)(a)		
Are containers, which have been out of service in excess of 1 year, been tested and proved hydrogen gastight at operating pressure and temperature? (c)(1)(vii)(b)		
Is the liquefied hydrogen vaporizer anchored and its connecting piping of sufficient flexibility to provide for the effect of expansion and contraction due to temperature changes? (c)(1)(viii)(a)		
Is the liquefied hydrogen vaporizer and its piping adequately protected on the hydrogen and heating media sections with safety relief devices? (c)(1)(viii)(b)		
Is the heat used in a liquefied hydrogen vaporizer indirectly supplied utilizing media such as air, steam, water, or water solutions? (c)(1)(viii)(c)		
Is a low temperature shutoff switch provided in the vaporizer discharge piping to prevent flow of liquefied hydrogen in the event of the loss of the heat source? (c)(1)(viii)(d)		
Is electrical wiring and equipment located within 3 feet of a point where connections are regularly made and disconnected, in accordance with subpart S of this part, for Class I, Group B, Division 1 locations? (c)(1)(ix)(a)		
Is electrical wiring and equipment located between 3 and 25 feet of a point where connections are regularly made and disconnected, in accordance with subpart S of this part, for Class I, Group B, Division 2 locations? (c)(1)(ix)(b)		
Is electrical wiring and equipment that is within 25 feet of a liquid hydrogen storage container in accordance with subpart S, for Class I, Group B, Division 2 locations? (c)(1)(ix)(b)		
Are the liquefied hydrogen container and associated piping electrically bonded and grounded? (c)(1)(x)		

1910.103 – HYDROGEN
(c) Liquefied Hydrogen Systems.

	YES	NO
Location of Liquefied Hydrogen Storage. (c)(2)		
General Requirements. (c)(2)(i)		
Are storage containers located so that they are readily accessible to mobile supply equipment at ground level and to authorized personnel? (c)(2)(i)(a)		
Are containers so located that they will not be exposed by electric power lines, flammable liquid lines, flammable gas lines, or lines carrying oxidizing materials? (c)(2)(i)(b)		
Where liquefied hydrogen containers are located on ground that is level with or lower than adjacent flammable liquid storage or liquid oxygen storage, are suitable protective means taken to prevent accumulation of liquids within 50 feet of the liquefied hydrogen container? (c)(2)(i)(d)		
Are all storage sites fenced and posted to prevent entrance by unauthorized personnel? (c)(2)(i)(e)		
Are storage sites placarded as follows: "Liquefied Hydrogen-Flammable Gas-No Smoking-No Open Flames"? (c)(2)(i)(e)		
Do liquefied hydrogen containers, that are located as specified in Table H-3, (see Appendix) have the safety relief devices vented unobstructed to the outdoors at a minimum elevation of 25 feet above grade to a safe location? (c)(2)(i)(f)		
NOTE: The venting of the discharge must be in such a manner as to prevent impingement of escaping liquid or gas upon the container, adjacent structures, or personnel.		
Specific Requirements. (c)(2)(ii)		
Is the location of liquefied hydrogen storage, as determined by the maximum total quantity of liquefied hydrogen, stored as indicated in Table H-3? (See Appendix.) (c)(2)(ii)(a)		
Is Table H-4 (see Appendix) used as a guide in determining the minimum distance from liquid hydrogen systems to exposures? (c)(2)(ii)(b)		
Are portable liquefied hydrogen containers with a capacity of 50 gallons or less, that are housed inside buildings not located in a special room and exposed to other occupancies, stored in accordance with the following requirements:		
(a) Are they located 20 feet from flammable liquids and readily combustible materials?		
(b) Are they located at least 25 feet from ordinary electrical equipment and other sources of ignition including process or analytical equipment?		
(c) Are they located at least 25 feet from concentrations of people?		
(d) Are they at least 50 feet from intakes of ventilation and air-conditioning equipment or intakes of compressors?		
(e) Are they at least 50 feet from storage of other flammable-gases or storage of oxidizing gases?		
(f) Are containers protected against damage or injury due to falling objects or work activity in the area?		
(g) Are containers firmly secured and stored in an upright position?		
(h) Is welding or cutting operations, and smoking prohibited while hydrogen is in the room?		
(i) Is the area adequately ventilated?		
Are safety relief devices on the containers vented directly indoors or to a suitable hood? (c)(2)(iii)		

1910.103 – HYDROGEN
(c) Liquefied Hydrogen Systems.

YES NO

Design Considerations at Specific Locations. (c)(3)

Outdoor Locations. (c)(3)(i)(a)

Are roadways and yard surfaces located below liquefied hydrogen piping, constructed of noncombustible materials? (c)(3)(i)(b)

Are protective walls, if provided, constructed of noncombustible materials? (c)(3)(i)(c)

Is electrical wiring and equipment located within 3 feet of a point where connections are regularly made and disconnected, in accordance with subpart S of this part, for Class I, Group B, Division 1 locations? (c)(3)(i)(d)

Is electrical wiring and equipment located between 3 and 25 feet of a point where connections are regularly made and disconnected, in accordance with subpart S of this part, for Class I, Group B, Division 2 locations? (c)(3)(i)(d)

Is electrical wiring and equipment that is within 25 feet of a liquid hydrogen storage container in accordance with subpart S, for Class I, Group B, Division 2 locations? (c)(3)(i)(d)

Is adequate lighting provided for nighttime transfer operations? (c)(3)(i)(e)

Separate Buildings. (c)(3)(ii)

Are separate buildings of light noncombustible construction on a substantial frame? (c)(3)(ii)(a)

Are walls and roofs lightly fastened and designed to relieve at a maximum internal pressure of 25 pounds per square foot? (c)(3)(ii)(a)

Are windows of shatterproof glass or plastic in metal frames? (c)(3)(ii)(a)

Are doors located in such a manner that they will be readily accessible to personnel in an emergency? (c)(3)(ii)(a)

Is adequate ventilation to the outdoors provided? (c)(3)(ii)(b)

Are inlet openings for ventilation located near the floor level in exterior walls only? (c)(3)(ii)(b)

Are outlet ventilation openings located at the high point of the room in exterior walls or roof? (c)(3)(ii)(b)

Do both the inlet and outlet vent openings have a minimum total area of 1 square foot per 1,000 cubic feet of room volume? (c)(3)(ii)(b)

Is the discharge from outlet openings directed or conducted to a safe location? (c)(3)(ii)(b)

Are all sources of ignition prohibited? (c)(3)(ii)(c)

Is electrical wiring and equipment in accordance with the following reproductions of (c)(1)(ix)(a) and (b):

Is electrical wiring and equipment located within 3 feet of a point where connections are regularly made and disconnected, in accordance with subpart S of this part, for Class I, Group B, Division 1 locations? (c)(3)(ii)(d)

Is electrical wiring and equipment located between 3 and 25 feet of a point where connections are regularly made and disconnected, in accordance with subpart S of this part, for Class I, Group B, Division 2 locations? (c)(3)(ii)(d)

1910.103 – HYDROGEN
(c) Liquefied Hydrogen Systems.

YES NO

Is electrical wiring and equipment that is within 25 feet of a liquid hydrogen storage container in accordance with subpart S, for Class I, Group B, Division 2 locations? (c)(3)(ii)(d)

If heating is provided, is it by steam, hot water, or other indirect means? (c)(3)(ii)(e)

Special Rooms. (c)(3)(iii)

Do walls, floors, and ceilings have a fire resistance rating of at least 2 hours? (c)(3)(iii)(a)

Are walls or partitions continuous from floor to ceiling and are they securely anchored? (c)(3)(iii)(a)

Is at least one wall an exterior wall? (c)(3)(iii)(a)

Are openings to other parts of the building prohibited? (c)(3)(iii)(a)

Are windows and doors in exterior walls? (c)(3)(iii)(a)

Are doors located in such a manner that they will be accessible in an emergency? (c)(3)(iii)(a)

Are windows made of shatterproof glass or plastic in metal frames? (c)(3)(iii)(a)

Does the ventilation comply with the following reproductions of 1910.103(c)(3)(ii)(b):

Is adequate ventilation to the outdoors provided?
Are inlet openings for ventilation located near the floor level in exterior walls only?
Are outlet ventilation openings located at the high point of the room in exterior walls or roof?
Do both the inlet and outlet vent openings have a minimum total area of 1 square foot per 1,000 cubic feet of room volume?
Is the discharge from outlet openings directed or conducted to a safe location? (c)(3)(iii)(b)

Is explosion venting provided in exterior walls or roof only? (c)(3)(iii)(c)

Is the venting area equal to not less than 1 square foot per 30 cubic feet of room volume? (c)(3)(iii)(c)

Does the explosion venting consist of any one or any combination of the following:

(1) Walls of light noncombustible material?
(2) Lightly fastened hatch covers?
(3) Lightly fastened swinging doors opening outward in exterior walls?
(4) Lightly fastened walls or roofs designed to relieve at a maximum pressure of 25 pounds per square foot? (c)(3)(iii)(c)

Are all sources of ignition prohibited? (c)(3)(iii)(d)

Does all electrical wiring and equipment comply with the following reproductions of 1910.103(c)(1)(ix)(a) and (b):

Is electrical wiring and equipment located within 3 feet of a point where connections are regularly made and disconnected, in accordance with subpart S of this part, for Class I, Group B, Division 1 locations? (c)(3)(iii)(e)

1910.103 – HYDROGEN

(c) Liquefied Hydrogen Systems.

	YES	NO
Is electrical wiring and equipment located between 3 and 25 feet of a point where connections are regularly made and disconnected, in accordance with subpart S of this part, for Class I, Group B, Division 2 locations? (c)(3)(iii)(e)		
Is electrical wiring and equipment that is within 25 feet of a liquid hydrogen storage container in accordance with subpart S, for Class I, Group B, Division 2 locations? (c)(3)(iii)(e)		
If heating is provided, is it by steam, hot water, or other indirect means? (c)(3)(iii)(f)		
Operating Instructions. (c)(4)		
Are all installations which require any operation of equipment by the user provided with legible instructions at operation locations? (c)(4)(i)		
Is a qualified person in attendance at all times while the mobile hydrogen supply unit is being unloaded? (c)(4)(ii)		
Is each mobile liquefied hydrogen supply unit used as part of a hydrogen system adequately secured to prevent movement? (c)(4)(iii)		
Is the mobile liquefied hydrogen supply unit grounded for static electricity? (c)(4)(iv)		
Maintenance. (c)(5)		
Is the equipment and functioning of each charged liquefied hydrogen system maintained in a safe operating condition in accordance with the requirements of this section? (c)(5)(i)		
Are weeds or similar combustibles prohibited within 25 feet of any liquefied hydrogen equipment? (c)(5)(ii)		
1910.104 – OXYGEN		
(a) Scope.		
The following items apply to the installation of bulk oxygen systems on industrial and institutional consumer premises. They **do not** apply to oxygen manufacturing plants or other establishments operated by the oxygen supplier or his agent for the purpose of storing oxygen and refilling portable containers, trailers, mobile supply trucks, or tank cars, nor to systems having a capacity less than 13,000 CF of oxygen, Normal Temperature Pressure (NTP). (a)		
(b) Bulk Oxygen Systems.		
Location. (b)(2)		
Are all bulk oxygen storage systems located aboveground out of doors? (b)(2)(i)		
Are they installed in a building of noncombustible construction, adequately vented, and used for that purpose exclusively? (b)(2)(i)		
Are such locations selected so that containers and associated equipment will not be exposed by electric power lines, flammable or combustible liquid lines, or flammable gas lines? (b)(2)(i)		
Is the system so located that it is readily accessible to mobile supply equipment at ground level and to authorized personnel? (b)(2)(ii)		

1910.104 – OXYGEN

(b) Bulk Oxygen Systems.

	YES	NO
Where liquid oxygen is stored, is noncombustible surfacing provided in an area in which any leakage of liquid oxygen might fall during operation of the system and filling of a storage container? (b)(2)(iii)		
NOTE: Asphaltic or bituminous paving is considered to be combustible.		
Where a bulk oxygen system is located on ground lower than adjacent flammable or combustible liquid storage, are suitable means taken to prevent accumulation of liquids under the bulk oxygen system? (b)(2)(v)		
Distance Between Systems and Exposures. (b)(3)		
Are the minimum distances, as indicated in the following items, maintained between bulk oxygen storage containers and other exposures? (b)(3)(i)		
Are they 50 feet from any combustible structures? (b)(3)(ii)		
Are they 25 feet from any structures with fire-resistive exterior walls or sprinklered buildings of other construction? (b)(3)(iii)		
Are they at least one-half the height of the adjacent side wall of the fire resistive structure? (b)(3)(iii)		
Are they at least 10 feet from any opening in adjacent walls of fire resistive structures? (b)(3)(iv)		
Are they at least 50 feet from flammable liquid storage aboveground of up to 1,000 gallon capacity? (b)(3)(v)		
Are they at least 90 feet away from flammable storage aboveground with 1,001 gallons or more capacity? (b)(3)(v)		
Are they at least 25 feet away from combustible liquid storage aboveground with up to 1,000 gallon capacity? (b)(3)(vii)		
Are they at least 50 feet away from combustible liquid storage aboveground with 1,001 gallons or more capacity? (b)(3)(vii)		
Are they at least 15 feet from below ground combustible liquid storage tanks? (b)(3)(viii)		
Are they at least 40 feet from filling and vent connections or openings to below ground combustible liquid storage tanks? (b)(3)(viii)		
Are they at least 50 feet away from flammable gas storage with a capacity of less than 5,000 cubic feet normal temperature and pressure? (b)(3)(ix)		
Are they at least 90 feet away from flammable gas storage with a capacity of 5,000 or more cubic feet normal temperature and pressure? (b)(3)(ix)		
Are they at least 50 feet from solid materials which burn rapidly? (b)(3)(x)		
Are they at least twenty-five feet from solid materials which burn slowly? (b)(3)(xi)		
Are they at least seventy-five feet in one direction, and 35 feet in approximately 90° direction from confining walls to provide adequate ventilation in courtyards and similar confining areas? (b)(3)(xii)		
Are they at least twenty-five feet from congested areas such as offices, lunchrooms, locker rooms, etc.? (b)(3)(xiii)		

1910.104 – OXYGEN
(b) Bulk Oxygen Systems.

YES NO

The items in (b)(3)(ii), (iii), and (v) to (xi) inclusive above **do not** apply where protective structures such as firewalls of adequate height to safeguard the oxygen storage systems are located between the bulk oxygen storage installation and the exposure. In such cases, however, the bulk oxygen storage installation may be a minimum distance of 1 foot from the firewall. **(b)(3)(xviii)**

Storage Containers. **(b)(4)**

Are permanently installed containers provided with substantial combustible supports on firm noncombustible foundations? **(b)(4)(i)**

Are liquid oxygen storage containers fabricated from materials meeting the impact test requirements of paragraph UG-84 of the ASME Boiler and Pressure Vessel Code, Section VIII-Unfired Pressure Vessels-1968? **(b)(4)(ii)**

Are liquid oxygen storage containers operating at pressures above 15 pounds per square inch gauge (p.s.i.g.) designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VII-Unfired Pressure Vessels-1968? **(b)(4)(ii)**

Is insulation surrounding the liquid oxygen container noncombustible? **(b)(4)(ii)**

Are high-pressure gaseous oxygen containers designed, constructed, and tested in accordance with appropriate requirements of ASME Boiler and Pressure Vessel Code, Section VIII-Unfired Pressure Vessels-1968? or
Are they designed, constructed and tested in accordance with DOT Specifications and Regulations? **(b)(4)(iii)**

Piping, Tubing, and Fittings. **(b)(5)**

Are all piping, tubing, and fittings suitable for oxygen service and for the pressures and temperatures involved? **(b)(5)(i)**

Does piping and tubing conform to Section 2-Gas and Air Piping Systems of Code for Pressure Piping, ANSI, B31.1-1967 with addenda B31.10a-1969? **(b)(5)(ii)**

Is piping or tubing for operating temperatures below -20°F. fabricated from materials meeting the impact test requirements of paragraph UG-84 of ASME Boiler and Pressure Vessel Code, Section VIII-Unfired Pressure Vessels-1968, when tested at the minimum operating temperature to which the piping may be subjected in service? **(b)(5)(iii)**

Safety Relief Devices – General. **(b)(6)**

Are bulk oxygen storage containers, regardless of design pressure, equipped with safety relief devices as required by the ASME code or the DOT specifications and regulations? **(b)(6)(i)**

Are bulk oxygen storage containers designed and constructed in accordance with DOT specifications, and are they equipped with safety relief devices as required thereby? **(b)(6)(ii)**

1910.104 – OXYGEN
(b) Bulk Oxygen Systems.

YES NO

Are bulk oxygen storage containers that are designed and constructed in accordance with the ASME Boiler and Pressure Code, Section VIII-Unfired Pressure Vessel-1968, equipped with safety relief devices meeting the provisions of the Compressed Gas Association Pamphlet "Safety Relief Device Standards for Compressed Gas Storage Containers," S-1, Part 3? **(b)(6)(iii)**

Are insulation casings on liquid oxygen containers equipped with suitable safety relief devices? **(b)(6)(iv)**

Are all safety relief devices so designed or located that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device? **(b)(6)(v)**

Liquid Oxygen Vaporizers. **(b)(7)**

Are liquid oxygen vaporizers anchored, and is the connecting piping sufficiently flexible to provide for the effect of expansion and contraction due to temperature changes? **(b)(7)(i)**

Is the liquid oxygen vaporizer and its piping adequately protected on the oxygen and heating medium sections with safety relief devices? **(b)(7)(ii)**

Is the heat used in an oxygen vaporizer indirectly supplied only through media such as steam, air, water, or water solutions which do not react with oxygen? **(b)(7)(iii)**

If electric heaters are used to provide the primary source of heat, is the vaporizing system electrically grounded? **(b)(7)(iv)**

Equipment Assembly and Installation. **(b)(8)**

Is all equipment making up a bulk oxygen system cleaned in order to remove oil, grease or other readily oxidizable materials before placing the system in service? **(b)(8)(i)**

Are all gaskets or thread sealants used in fittings suitable for oxygen service? **(b)(8)(ii)**

Is the installation of bulk oxygen systems supervised by personnel familiar with proper practices with reference to their construction and use? **(b)(8)(iv)**

After installation, is all field erected piping tested and proved gas tight at maximum operating pressures, and is any medium used for testing for oil free and nonflammable? **(b)(8)(v)**

Are all storage containers, piping, valves, regulation equipment, and other accessories protected against physical damage and against tampering? **(b)(8)(vi)**

Are all enclosures containing oxygen control or operating equipment adequately vented? **(b)(8)(vii)**

Is the bulk oxygen storage location permanently placarded to indicate: "OXYGEN– NO SMOKING–NO OPEN FLAMES"? **(b)(8)(viii)**

Is all electrical equipment involved in bulk oxygen systems in accordance with the applicable provisions of subpart S? **(b)(8)(ix)**

1910.104 — OXYGEN

YES NO N/A

Operating Instructions. **(b)(9)**

Are legible instructions maintained at operating locations for installations which require any operation of equipment by the user? **(b)(9)**

Maintenance. **(b)(10)**

Is the equipment and functioning of such charged bulk oxygen system maintained in a safe operating condition, in accordance with the requirements of this section, and is wood and long dry grass cut back within 15 feet of any bulk oxygen storage container?

1910.105 — NITROUS OXIDE

YES NO N/A

Is the piped systems for the in-plant transfer and distribution of nitrous oxide designed, installed, maintained, and operated in accordance with Compressed Gas Association Pamphlet G-8. 1-1964?

(a) Definitions

Aerosol. A material which is dispensed as a mist, spray, or foam by a propellant under pressure.

Atmospheric tank. A storage tank designed to operate at pressures from atmospheric through 0.5 p.s.i.g.

Automotive service station. Where flammable or combustible liquids used as motor fuels are stored and dispensed from fixed equipment into the fuel tanks of motor vehicles including any facilities available for the sale and service of tires, batteries, and accessories and for minor automotive maintenance work.

Barrel. A volume of 42 U.S. gallons.

Basement. A story of a building or structure having one-half or more of its height below ground level.

Boiling point. The boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm).

Where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, for purposes of this section the 10 percent point of a distillation performed in accordance with the Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62, may be used as the boiling point of the liquid.

Boilover. The expulsion of crude oil (or certain other liquids) from a burning tank.

The light fractions of the crude oil burnoff producing a heat wave in the residue, which on reaching a water strata may result in the expulsion of a portion of the contents of the tank in the form of froth.

Bulk plant. Where flammable or combustible liquids are received by tank vessel, pipelines, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distribution by similar conveyances or containers.

Chemical plant. A large integrated plant or portion of a plant other than a refinery or distillery where flammable or combustible liquids are produced or used in chemical reactions.

Closed container. A container so sealed by means of a lid or other device that neither liquid nor vapor will escape from it at ordinary temperatures.

Combustible liquid. Any liquid having a flash point at or above 100°F (37.8°C). Combustible liquids are divided into two classes as follows:

Class II liquids include those with flash points at or above 100°F (37.8°C) and below 140°F (60°C) except any mixture having components with flash points of 200°F (93.3°C) or higher, the volume of which make up 99% or more of the total volume of the mixture.

Class III liquids include those with flash points at or above 140°F (60°C), and below 200°F (93.3°C) except any mixture having components with flash points of 200°F (93.3°C), or higher, the total volume of which make up 99% or more of the total mixture.

Class IIIA liquids include those with flash points at or above 140°F (60°C) and below 200°F (93.3°C), except any mixture having components with flash points of 200°F (93.3°C), or higher, the total volume of which make up 99% or more of the total mixture.

Class IIIB liquids include those with flashpoints at or above 200°F (93.3°C). This section does not cover Class IIIB liquids. Where the term "Class III liquids is used in this section, it shall mean only Class IIIA liquids.

NOTE: When a combustible liquid is heated for use to within 30°F (16.7°C) of its flashpoint, it shall be handled in accordance with the requirements for the next lower class of liquids.

Container. Any can, barrel, or drum.

Crude petroleum. Hydrocarbon mixtures that have a flash point below 150°F and which have not been processed in a refinery.

Distillery. A plant or portion of a plant where flammable or combustible liquids produced by fermentation are concentrated, and where the concentrated products may also be mixed, stored, or packaged.

Fire area. An area of a building separated from the remainder of the building by construction having a fire resistance of at least 1 hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least 1 hour.

Flammable aerosol. An aerosol which is required to be labeled "Flammable" under the Federal Hazardous Substances Labeling Act (15 U.S.C. 1261).

Flammable liquid. Any liquid having a flash point below 100°F (37.8°C), except any mix tore having components with flash points of 100°F (37.8°C) or higher, the total of which make up 99% or more of the total volume of the mixture. Flammable liquids shall be known as Class I liquids. Class I liquids are divided into three classes as follows:

Class IA includes liquids having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C.)

Class IB includes liquids having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C).

Class IC includes liquids having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C).

Flash point. The minimum tempera tore at which a liquid gives off vapor within a test vessel in sufficient concentration to form an ignitable mixture with air near the surface of the liquid, and shall be determined as follows:

For a liquid which has a viscosity of 45 SUS at 100°F. (37.8°C.), does not contain suspended solids, and does not have a tendency to form a surface film while under test, the procedure specified in the Standard Method Test for Flashpoint by Tag Closed Tester (ASTM D-56-70) shall be used.

For a liquid which has a viscosity of 45 SUS or more at 100°F. (37.8°C.), or contains suspended solids, or has a tendency to form a surface film while under test, the Standard Method of Test for Flashpoint by Pensly-Martens Closed Tester (AȘTM D-93-71) shall be used, except that the methods specified in Note 1 to section 1.1 of ASTM D-93 may be used for the respective materials specified in the Note.

For a liquid that is a mixture of compounds that have different volatiles and flashpoints, its flashpoint shall be determined by using the procedure specified in paragraph (a)(14)(i) or (ii) of this section on the liquid in the form it is shipped. If the flashpoint, as determined by this test, is 100°F. (37.8°C.) or higher, an addition flashpoint determination shall be run on a sample of the liquid evaporated to 90 percent of its original volume, and the lower value of the two tests shall be considered the flashpoint of the material.

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified in this subparagraph.

Hotel. Buildings or groups of buildings under the same management in which there are sleeping accommodations for hire, primarily used by transients who are lodged with or without meals including but not limited to inns, clubs, motels, and apartment hotels.

Institutional occupancy. The occupancy or use of a building or structure or any portion thereof by persons harbored or detained to receive medical, charitable or other care or treatment, or by persons involuntarily detained.

Liquid. Any material which has a fluidity greater than that of 300 penetration asphalt when tested in accordance with ASTM Test for Penetration for Bituminous Materials, D-5-65. When not otherwise identified, the term liquid shall include both flammable and combustible liquids.

Low pressure tank. A storage tank which has been designed to operate at pressures above 0.5 p.s.i.g. but not more than 15 p.s.i.g.Marine service station. Where flammable or combustible liquids used as fuels are stored and dispensed from fixed equipment on shore, piers, wharves, or floating docks into the fuel tanks of self-propelled craft, including all facilities used in connection therewith.

Office occupancy. The occupancy or use of a building or structure or any portion thereof for the transaction of business, or the rendering or receiving of professional services.

Portable tank. A closed container having a liquid capacity over 60 U.S. gallons and not intended for fixed installation.

Pressure vessel. A storage tank or vessel which has been designed to operate at pressures above 15 p.s.i.g.

Protection for exposure. Adequate fire protection for structures on property adjacent to tanks, where there are employees of the establishment.

Refinery. A plant in which flammable or combustible liquids are produced on a commercial scale drum elude petroleum, natural gasoline, or other hydrocarbon sources.

Safety can. An approved container, of not more than 5 gallons capacity, having a spring-closing lid and spout cover to safely relieve internal pressure when subjected to fire exposure.

SUS. Saybolt Universal Seconds as determined by the Standard Method of Test for Saybolt Viscosity (ASTM D 8R-56).

Unstable (reactive) liquid. A liquid which in the pure state or as commercially produced or transported will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure, or temperature.

Vapor pressure. The pressure exerted by a volatile liquid.

Ventilation. For the prevention of fire and explosion, ventilation is considered adequate if it is sufficient to prevent accumulation of significant quantities of vapor-air mixtures in concentration over one-fourth of the lower flammable limit.

Viscous. Having a viscosity of 45 SUS or more.

(b) Tank Storage

		YES	NO	N/A
Design and Construction of Tanks	**(b)(1)**			
Are tanks built of steel, except as provided in (b) through (e) of this subdivision?	**(b)(1)(i)(a)**			
NOTE: For underground installations, or where required by the properties of the liquid stored, tanks may be built of materials other than steel.	**(b)(1)(i)(b)**			
Are tanks located above ground or inside buildings of a noncombustible construction?	**(b)(1)(i)(b)**			
Are tanks built of materials other than steel designed to specifications embodying principles recognized as good engineering design for the material used?	**(b)(1)(i)(c)**			
Are unlined concrete tanks used for storing flammable or combustible liquids which have a gravity of 40° API or heavier?	**(b)(1)(i)(d)**			
If concrete tanks with special lining are used for other services are they designed in accordance with sound engineering practices?	**(b)(1)(i)(d)**			
[RESERVED]	**(b)(1)(i)(e)**			
Are special engineering considerations given if the specific gravity of the liquid to be stored exceeds that of water, or if the tanks are designed to contain flammable or combustible liquids at a liquids temperature below 0°F?	**(b)(1)(i)(f)**			
Fabrication				
[RESERVED]	**(b)(1)(ii)(a)**			
Are metal tanks welded, riveted, and caulked, brazed, or bolted, or constructed by use of a combination of these methods?	**(b)(1)(ii)**			
Is filler metal used in brazing of nonferrous metal or an alloy having a melting point above 1,000°F and below that of the metal joined?	**(b)(1)(ii)(b)**			
Atmospheric Tanks				
Are atmospheric tanks built in accordance with acceptable good standards of design?	**(b)(1)(iii)(a)**			

Atmospheric tanks may be built in accordance with:

> Underwriters' Laboratories, Inc. Subjects No. 142, Standard for Steel Aboveground Tanks for Flammable and Combustible Liquids, 1968; No. 58, Standard for Steel Underground Tanks for Flammable and Combustible Liquids, Fifth Edition, December 1961; or No. 80, Standard for Steel Inside Tanks for Oil-Burner Fuel, September 1963. **(b)(1)(iii)(a)(1)**
>
> American Petroleum Institute Standards No. 12A, Specification for Oil Storage Tanks with Riveted Shells, Seventh Edition, September 1951, or No. 650, Welded Steel Tanks for Oil Storage, Third Edition, 1966. **(b)(1)(iii)(a)(2)**
>
> American Petroleum Institute Standards No. 12B, Specification for Bolted Production Tanks, Eleventh Edition, May 1958, and Supplement 1, March 1962; No 12D, Specification for Large Welded Production Tanks, Fifth Edition, March 1961. **(b)(1)(iii)(a)(3)**
>
> Are tanks built in accordance with the preceding standards used only as production tanks for storage of crude petroleum in oil-producing areas? **(b)(1)(iii)(a)(3)**
>
> **NOTE**: Tanks designed for underground service service which do not exceed 2,500 gallons capacity may be used aboveground. Low pressure tanks and pressure vessels may be used as atmospheric tanks. **(b)(1)(iii)(b-c)**

Is the use of atmospheric tanks prohibited for the storage of a flammable or combustible liquid at a temperature at or above its boiling point? **(b)(1)(iii)(d)**

Low Pressure Tanks

Does the normal operating pressure of the tank preclude exceeding the design pressure of the tank? **(b)(1)(iv)(a)**

Are low-pressure tanks built in accordance with acceptable standards of design? **(b)(1)(iv)(b)**

Low pressure tanks may be built in accordance with:

> American Petroleum Institute Standard No. 620. Recommended Rules for the Design and Construction of Large, Welded, Low-Pressure Storage Tanks, Third Edition, 1966. **(b)(1)(iv)(b)(1)**
>
> The principles of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pessure Vessels Code, 1968. **(b)(1)(iv)(b)(2)**
>
> Are atmospheric tanks built according to Underwriters' Laboratories, Inc. requirements in subdivision (iii)(a), limited to 2.5. p.s.i.g. under emergency venting conditions? **(b)(1)(iv)(c)**
>
> Do pressure vessels used as low-pressure tanks not exceed operating pressures of 1 p.s.i.g.? **(b)(1)(iv)(d)**

Pressure Vessels

Are steps taken to insure that the normal operating pressure of vessels will not exceed the design pressure of the vessel? **(b)(1)(v)(a)**

Are pressure vessels built in accordance with the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code 1968? **(b)(1)(v)(b)**

Provisions for Internal Corrosion

Are additional metal thicknesses or suitable protective coatings provided to compensate for the corrosion loss, if corrosion loss is anticipated? **(b)(1)(vi)**

Installation of Outside Aboveground Tanks

[RESERVED] **(b)(2)(i)**

Spacing (Shell-to-Shell) Between Above Ground Tanks. **(b)(2)(ii)**

Is the distance between any two flammable or combustible liquid storage tanks at least 3 feet? **(b)(2)(ii)(a)**

Is the distance between any two adjacent flammable or combustible liquid storage tanks at least one-sixth the sum of their diameters? **(b)(2)(ii)(b)**

When the diameter of one tank is less than one-half the diameter of an adjacent tank, is the distance between the two tanks not less than one-half the diameter of the smaller tank? **(b)(2)(ii)(b)**

Do crude petroleum tanks having capacities not exceeding 126,000 gallons, used in conjunction with production facilities that are located in noncongested areas, have a distance between such tanks of at least 3 feet? **(b)(2)(ii)(c)**

Where unstable flammable or combustible liquids are stored, is the distance between such tanks at least one-half the sum of their diameters between them? **(b)(2)(ii)(d)**

When tanks are compacted in three or more rows or in an irregular pattern, is greater spacing used or are other means provided so that inside tanks are accessible for fire fighting purposes? **(b)(2)(ii)(e)**

Is the minimum separation between a liquefied petroleum gas container and a flammable or combustible liquid storage tank at least 20 feet? **(b)(2)(ii)(f)**

> **EXCEPTION**: If the flammable or combustible liquid tanks operate at pressures exceeding 2.5 p.s.i.g., or are equipped with emergency venting, which will permit pressures to exceed 2.5 p.s.i.g. items (a) and (b) above must be complied with.

Are suitable means taken to prevent the accumulation of flammable or combustible liquids under adjacent liquefied petroleum gas containers? **(b)(2)(ii)(f)**

If flammable or combustible liquid storage tanks are within a diked area, are provisions made to ensure that LPG containers are outside the diked area and at least 10 feet away from the centerline of the wall of the diked area? **(b)(2)(ii)(f)**

> **NOTE**: The provisions Immediately above do not apply when liquefied petroleum gas containers of 125 gallons or kegs capacity are installed adjacent to fuel oil supply tanks of 550 gallons or kegs capacity.

YES NO N/A

[RESERVED] (b)(2)(iii)

Normal Venting for Aboveground Tanks

Are atmospheric storage tanks adequately vented to prevent the development of vacuum or pressure sufficient to distort the roof of a cone roof tank, or exceeding the design pressure in the case of other atmospheric tanks, as a result of filling or emptying, and temperature changes? **(b)(2)(iv)(a)**

Are normal vents sized either in accordance with the American Petroleum Institute Standard 2000 (1968), or any other accepted standard, or are they at least as large as the filling or withdrawal connection, but in no case less than 1¼ inch nominal inside diameter? **(b)(2)(iv)(b)**

Are low-pressure tanks and pressure vessels adequately vented to prevent development of pressure or vacuum, or from exceeding the design pressure of the tank or vessel? **(b)(2)(iv)(c)**

Is protection also provided to prevent overpressure from any pump discharging into the tank or vessel when the pump discharge pressure can exceed the design pressure of the tank or vessel? **(b)(2)(iv)(c)**

Is the vent size based on the maximum anticipated simultaneous flow if the tank or pressure vessel has more than one fill or withdrawal connection? **(b)(2)(iv)(d)**

Is the vent designed to limit the internal pressure to 2.5 p.s.i. or less? **(b)(2)(iv)(e)**

If not, is the outlet of vents and vent drains arranged to discharge in such a manner as to prevent localized overheating of any part of the tank in the event vapors from such vents are ignited? **(b)(2)(iv)(e)**

Are tanks and pressure vessels storing Class IA liquids equipped with venting devices which are normally closed, except when venting to pressure or vacuum conditions? **(b)(2)(iv)(f)**

Are tanks and pressure vessels storing Class IB and IC liquids equipped with venting devices which are normally closed, except when venting under pressure or vacuum conditions or with approved flame arresters? **(b)(2)(iv)(f)**

> **EXCEPTION:** Tanks of 3,000 bbls. capacity or less containing crude petroleum in crude-producing areas: and, outside above ground atmospheric tanks under 1,000 gals. capacity containing other than Class IA flammable liquids may have open vents.
>
> **NOTE:** If flame arresters or venting devices as required in item (f) above may cause tank damage due to obstruction, they may be omitted from Class IB and IC liquid containers. **(b)(2)(iv)(g)**

Emergency Relief Venting for Fire Exposure for Aboveground Tanks

Does every above ground storage tank have some form of construction or device that will relieve excessive internal pressure caused by exposure fires? **(b)(2)(v)(a)**

If a weak roof-to-shell seam is used to relieve excessive internal pressure in a vertical tank, is the roof-to-shell seam constructed to fail, preferential to any other seam? **(b)(2)(v)(b)**

YES NO N/A

If emergency relief is dependent entirely upon pressure relieving devices, is the total venting capacity of both normal and emergency vents sufficient to prevent rupture of the shell or bottom of the tank if vertical, or of the shell or heads if horizontal? **(b)(2)(v)(c)**

Are the effects of heat or gas resulting from polymerization, decomposition, condensation, or self-reactivity if unstable liquids are stored, are they taken into account when designing relief devices? **(b)(2)(v)(c)**

Is the total capacity of both normal and emergency venting devices at least those that are derived from Table H-10? **(b)(2)(v)(c)**

Is the relief device either a self-closing manhole cover, or one using long bolts that permit the cover to lift under internal pressure, or an additional or larger relief valve or valves? **(b)(2)(v)(c)**

Is the wetted area of the tank calculated on the basis of 55 percent of the total exposed area of a sphere or spheroid? **(b)(2)(v)(c)**

Is the wetted area of the tank calculated on 75 percent of the total exposed area of a horizontal tank and the first 30 feet above grade of the exposed shell area of a vertical tank? **(b)(2)(v)(c)**

TABLE H-10 — Wetted area versus cubic feet free air per hour.

(14.7 psia and 60° F.)

Square feet	CFH	Square feet	CFH	Square feet	CFH
20	21,100	200	211,000	1,000	524,000
30	31,600	250	239,000	1,200	557,000
40	42,100	300	265,000	1,400	587,000
50	52,700	350	288,000	1,600	614,000
60	63,200	400	312,000	1,800	639,000
70	73,700	500	354,000	2,000	662,000
80	84,200	600	392,000	2,400	704,000
90	94,800	700	428,000	2,800	742,000
100	105,000	800	462,000	and	
120	126,000	900	493,000	over	
140	147,000	1,000	524,000		
160	168,000				
180	190,000				
200	211,000				

For tanks and storage vessels designed for pressure over 1 p.s.i.g., is the total rate of venting determined in accordance with Table H-10? **(b)(2)(v)(d)**

> **EXCEPTION:** When the exposed wetted area of the surface is greater than 2,800 square feet, is the total rate of venting calculated by the following formula:
>
> $$CFH = 1.107A^{0.82}$$
>
> Where:
>
> CFH = Venting requirement, in cubit feet of free air per hour.
>
> A = Exposed wetted surface, in sq. ft.

NOTE: The foregoing formula is based on $Q = 21{,}000A^{0.82}$

The total emergency relief venting capacity for any specific stable liquid can be determined by the following formula:

$$V = \frac{1337}{L\sqrt{M}}$$

V = Cubic feet of free air per hour from Table H-10

L = Latent heat of vaporization of specific liquid in Btu per lb.

M = Molecular weight of specific liquids (b)(2)(v)(e)

The required airflow rate of subdivision (c) or (e) of this subdivision may be multiplied by protection the appropriate factor listed in the following schedule when protection is provided as indicated. Only one factor may be used for any one tank:

0.5 for drainage in accordance with subdivision (vii)(hi of this subparagraph for tanks over 200 square feet of wetted area.

0.3 for approved water spray

0.3 for approved insulation

0.15 for water spray with approved insulation (b)(2)(v)(f)

Is the outlet of all vents and vent drains on tanks equipped with emergency venting to permit press ores exceeding 2.5 p.s.i.g., arranged to discharge in such a way as to prevent localized overheating of any part of the tank, in the event vapors from such vents are ignited? (b)(2)(v)(g)

Does each commercial tank venting device have stamped on it the opening pressure, the pressure at which the valve reaches the full open position, and the flow capacity at the full open position pressure, expressed in cu. ft. per hour of air at 60°F, and at a pressure of 14.7 p.s.i.a.? (b)(2)(v)(h)

Is the flow capacity of tank venting devices 12 inches and smaller determined by actual test of each type and size of vent? (b)(2)(v)(i)

If the flow capacity of tank venting devices larger than 12 inches is calculated, (including manhole covers with long bolts) does the word "calculated" appear on the nameplate and is the computation based on a flow coefficient of 0.5 applied to the rated orifice area? (b)(2)(v)(i)

Vent Piping for Aboveground Tanks

Is all vent piping constructed in accordance with paragraph (c), which follows later in this checklist? (b)(2)(vi)(a)

Are vent pipe outlets for tanks storing Class I liquids that are adjacent to buildings or public ways, located so that the vapors are released at a safe point outside of buildings and not less than 12 feet above the adjacent ground level? (b)(2)(vi)(b)

Are vapors discharged upward or horizontally away from closely adjacent walls? (b)(2)(vi)(b)

Are vent outlets located so that flammable vapors will not be trapped by eaves or other obstructions? (b)(2)(vi)(b)

Are vent outlets at least 5 feet away from building openings? (b)(2)(vi)(b)

When tank vent piping is manifolded, are pipe sizes chosen to discharge (within the pressure limitations of the system) the vapors they may be required to handle when manifolded tanks are subject to the same fire exposure? (b)(2)(vi)(c)

Drainage, Dikes, and Walls for Aboveground Tanks

Is the area surrounding a tank or a group of tanks provided with drainage as in subdivision (b) of this subdivision? (b)(2)(vii)(a)

If a drainage system isn't provided, is the area surrounding a tank or group of tanks diked as in subdivision (c) to prevent accidental discharge of liquid from endangering adjoining property or reaching waterways? (b)(2)(vii)(a)

Drainage

Where protection of adjoining property or waterways is by means of a natural or manmade drainage system, do such systems comply with the following: (b)(2)(vii)(b)

[RESERVED] (b)(2)(vii)(b)(1)

Does the drainage system terminate in vacant land or other area or in an impounding basin haying a capacity not smaller than that of the largest tank served? (b)(2)(vii)(b)(2)

Is the termination area and the route of the drainage system located so that, if the flammable or combustible liquids in the drainage system are ignited, the fire will not seriously expose tanks or adjoining property? (b)(2)(vii)(b)(2)

Diked Areas

Where protection of adjoining property or waterways is accomplished by retaining the liquid around the tank by means of dike, does the volume of the diked area shall comply with the following requirements:

Except as provided in subdivision (2) of this subdivision, is the volumetric capacity of the diked area not less than the greatest amount of liquid that can be released from the largest tank within the diked area, assuming a full tank? (2)(vii)(c)(1)

Is the capacity of the diked area enclosing more than one tank calculated by deducting the volume of the tanks other than the largest tank below the height of the dike? (b)(2)(vii)(c)(1)

For a tank or group of tanks with fixed roofs containing crude petroleum with boil over characteristics, is the volumetric capacity of the diked area less than the capacity of the largest tank served by the enclosure, assuming a full tank? (b)(2)(vii)(c)(2)

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	YES	NO	N/A
Is the capacity of the diked enclosure calculated by deducting the volume below the height of the dike of all tanks within the enclosure? **(b)(2)(vii)(c)(2)**			
Are the walls of the diked area constructed with earth, steel, concrete or solid masonry and designed to be liquid tight to withstand a full hydrostatic head? **(b)(2)(vii)(c)(3)**			
Do earthen walls 3 feet or more in height have a flat section at the top not less than 2 feet wide? **(b)(2)(vii)(c)(3)**			
Is the slope of an earthen wall consistent with the angle of repose of the material of which the wall is constructed? **(b)(2)(vii)(c)(3)**			
Are the walls of a diked area restricted to an average height of 6 feet above interior grade? **(b)(2)(vii)(c)(4)**			
[RESERVED] **(b)(2)(vii)(c)(5)**			
Are loose combustible materials, empty or full drums or barrels, kept out of the diked areas? **(b)(2)(vii)(c)(6)**			
Tank Openings Other Than Vents for Aboveground Tanks			
[RESERVED] **(b)(2)(viii)(a-c)**			
Are openings for gaging provided with a vapor tight cap or cover? **(b)(2)(viii)(d)**			
For Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, is the fill pipe designed and installed as to minimize the possibility of generating static electricity? **(b)(2)(viii)(d)**			
Does a fill pipe entering the top of a tank terminate within 6 inches of the bottom of the tank and installed to avoid excessive vibration? **(b)(2)(viii)(e)**			
Are filling and emptying connections which are made and broken located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening? **(b)(2)(viii)(f)**			
Is such a connection properly identified, closed and liquid tight when not in use? **(b)(2)(viii)(f)**			
Installation of Underground Tanks			
Location			
Is the excavation for underground storage tanks made with due care to avoid undermining of foundations of existing structures? **(b)(3)(i)**			
Are underground tanks or tanks under buildings so located with respect to existing building foundations and supports that the loads carried by the latter cannot be transmitted to the tank? **(b)(3)(i)**			
Is the distance from any part of a tank storing Class I liquids to the nearest wall of any basement or pit at least 1 foot? **(b)(3)(i)**			
Is the distance from a tank storing Class I liquids at least 3 feet away from any property line that may be built upon? **(b)(3)(i)**			
Is the distance from any part of a tank storing Class II or Class III liquids to the nearest wall of any basement, pit or property line at least 1 foot? **(b)(3)(i)**			

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	YES	NO	N/A
Depth and Cover			
Are underground tanks set on firm foundations and surrounded with at least 6 inches of noncorrosive, inert materials such as clean sand, earth, or gravel well tamped in place? **(b)(3)(ii)**			
Is the tank placed in the hole with care to prohibit dropping or rolling that could break a weld, puncture or damage the tank, or scrape off the protective coating of coated tanks? **(b)(3)(ii)**			
Are tanks covered with a minimum of 2 feet of earth, or are they covered with not less than 1 foot of earth, on top of which is placed a slab of reinforced concrete not less than 4 inches thick? **(b)(3)(ii)**			
When underground tanks are likely to be subject to traffic, are they protected against damage from vehicles passing over them by at least 3 feet of earth cover, or 18 inches of well-tamped earth, plus 6 inches of reinforced concrete or 8 inches of asphaltic concrete? **(b)(3)(ii)**			
When asphaltic or reinforced concrete paving is used, does it extend at least 1 foot horizontally beyond the outline of the tank in all directions? **(b)(3)(ii)**			
Corrosive Protection			
Is corrosive protection for the tank and its piping provided by one or more of the following methods:			
● Use of protective coatings or wrappings; **(b)(3)(iii)(a)**			
● Cathodic protection; **(b)(3)(iii)(b)**			
OR			
● Corrosion resistant materials of construction? **(b)(3)(iii)(c)**			
Vents			
Are vent pipes from tanks storing Class I liquids located so that the discharge point is outside of buildings? **(b)(3)(iv)(a)**			
Is the discharge point higher than the fill pipe opening and not less than 12 feet above the adjacent ground level? **(b)(3)(iv)(a)**			
Do vent pipes discharge only upward? **(b)(3)(iv)(a)**			
Are precautions taken to prevent the obstruction of vent pipes 2 inches or less in nominal inside diameter that will cause excessive back pressure? **(b)(3)(iv)(a)**			
Are vent pipe outlets so located that flammable vapors will not enter building openings, or be trapped under eaves or other obstructions? **(b)(3)(iv)(a)**			
Are vent pipes that are less than 10 feet in length, or greater than 2 inches in nominal inside diameter, provided with a vacuum and pressure relief valve, or is there an approved flame arrester located in the vent line at the outlet or within the approved distance from the outlet? **(b)(3)(iv)(a)**			
Is each tank vented through piping adequate in size to prevent blow-back of vapor or liquid at the fill opening while the tank is being filled? **(b)(3)(iv)(b)**			
Is the use of vent pipes that are not at least 1¼ inch nominal inside diameter prohibited? **(b)(3)(iv)(b)**			

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YES NO N/A

TABLE H-11 — Vent line diameters

Maximum flow GPM	Pipe length*		
	50 feet	100 feet	200 feet
	Inches	Inches	inches
100	1¼	1¼	1¼
200	1¼	1¼	1¼
300	1¼	1¼	1½
400	1¼	1¼	2
500	1½	1½	2
600	1½	2	2
700	2	2	2
800	2	2	3
900	2	2	3
1,000	2	2	3

*Vent lines of 50 ft., and 200 ft. of pipe plus 7 ells.

Do vent pipes from tanks storing Class II or Class III flammable liquids terminate outside of the building and higher than the fill pipe opening? **(b)(3)(iv)(c)**

Are the vent outlets above the normal snow level? **(b)(3)(iv)(c)**

Is vent piping constructed in accordance with 1910.106(c) which is located on Page H-18? **(b)(3)(iv)(d)**

Are vent pipes so laid as to drain toward the tank without sags or traps in which liquid can collect? **(b)(3)(iv)(d)**

Are vent pipes so located that they will not be subjected to physical damage? **(b)(3)(iv)(d)**

Does the tank end of the vent pipe enter the tank through the top? **(b)(3)(iv)(d)**

In manifolded tank venting are the pipe sizes chosen to discharge, within the pressure limitations of the system, the vapors they may be required to handle when manifolded tanks are filled simultaneously? **(b)(3)(iv)(e)**

Tanks Openings Other Than Vents

Are all connections for tank openings vapor and liquid tight? **(b)(3)(v)(a)**

Are openings for manual gaging provided with a liquid tight cover, if they are independent of the fill pipe? **(b)(3)(v)(b)**

If openings for manual gaging are inside a building, is each opening protected against liquid overflow and possible vapor release by means of a spring loaded check valve or other approved device? **(b)(3)(v)(b)**

Do fill and discharge lines enter the tanks only through the top? **(b)(3)(v)(c)**

Are fill lines sloped toward the tank? **(b)(3)(v)(c)**

For Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, is the fill pipe so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank? **(b)(3)(v)(d)**

Are filling and emptying connections which are made and broken located outside of buildings of a location free from any source of ignition and not less than 5 feet away from any building opening? **(b)(3)(v)(e)**

Are filling and emptying connections closed and liquid tight when not in use? **(b)(3)(v)(e)**

Are the filling and emptying connections properly identified? **(b)(3)(v)(e)**

Installation of Tanks Inside of Buildings **(b)(4)**

Location

Except as specifically provided in industrial plants, paragraph (e); service stations, paragraph (g); processing plants, paragraph (h); and refineries, chemical plants and distilleries, paragraph (i) of this section, are tanks prohibited from being installed inside of buildings? **(b)(4)(i)**

Vents

Do vents for tanks that are authorized to be placed inside of buildings comply with the following items which are taken from 1910.106(b)(2)(iv), (v) see Page H-12, (vi)(b) see Page H-13, and (3)(iv) see Page H-14? **(b)(4)(ii)**

> **EXCEPTION:** Emergency venting by the use of weak roof seams on tanks is prohibited.

Is vent piping constructed in accordance with paragraph (c) of this section?

Do vents discharge vapors outside of buildings? **(b)(4)(ii)**

Is vent piping constructed in accordance with paragraph (c) of this section? **(b)(4)(iii)**

Tank Openings Other Than Vents

Are connections for all tank openings vapor or liquid tight? **(b)(4)(iv)(a)**

Is each connection to a tank inside of a building through which liquid can normally flow, provided with an internal or an external valve located as close as practical to the shell of the tank? **(b)(4)(iv)(b)**

When such valves are external, are their connections to the tank made of steel, except when the chemical characteristics of the liquid stored are incompatible with steel? **(b)(4)(iv)(b)**

When materials other than steel are necessary, are they suitable for the pressures, structural stresses, and temperatures involved, including fire exposures? **(b)(4)(iv)(b)**

Are flammable or combustible liquid tanks inside of buildings provided with an automatic-closing heat-activated valve on each withdrawal connection below the liquid level? **(b)(4)(iv)(c)**

> **NOTE:** The paragraph above does not apply to tanks located inside of one-story buildings that are designed and protected for flammable or combustible liquid storage, nor does it apply to connections used for emergency disposal to prevent continued flow in the event of fire in the vicinity of the tank.
>
> **NOTE:** The automatic-closing heat-actuated valve may be incorporated in the valve required in item (b). If it is a separate valve, it shall be located adjacent to the valve required in item (b). **(b)(4)(iv)(c)**

Are openings for manual gaging, if independent to the fill pipe provided with a vapor tight cap or cover? **(b)(4)(iv)(d)**

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Is each such opening protected against liquid overflow and possible vapor release by means of a spring-loaded check valve or other approved device? **(b)(4)(iv)(d)**			
Is the fill pipe for Class IB and Class IC liquids other than crude oils, gasolines, and asphalts, so designed and installed as to minimize the possibility of generating static electricity by terminating within 6 inches of the bottom of the tank? **(b)(4)(iv)(e)**			
Is the fill pipe inside of the tank so installed as to avoid excessive vibration of the pipe? **(b)(4)(iv)(f)**			
Is the inlet of the fill pipe located outside of buildings at a location free from any source of ignition and not less than 5 feet away from any building opening? **(b)4)(iv)(g)**			
Is the inlet of the fill pipe closed and liquid tight when not in use? **(b)(4)(iv)(g)**			
Is the fill connection properly identified? **(b)(4)(iv)(g)**			
Are tanks inside of buildings equipped with a device on other means to prevent overflow into the building? **(b)(4)(iv)(h)**			
Supports, Foundations, and Anchorage For All Tank Locations			
Are tank supports installed on firm foundations? **(b)(5)(i)**			
Do tank supports consist of concrete, masonry, or protected steel? **(b)(5)(i)** **NOTE:** Single wood timber supports laid horizontally may be used for outside above ground tanks if not more than 1 inches high at their lowest point.			
Fire Resistance			
Are steel supports or exposed piling protected by materials having a fire resistance rating of not less than 2 hours? **(b)(5)(ii)** **EXCEPTION:** Steel saddles need not be protected if less than 12 inches high at their lowest point. **NOTE:** Water spray protection or its equivalent may be used in lieu of fire-resistive materials to protect supports.			
Spheres			
Does the design of the supporting structure for tanks such as spheres receive special engineering consideration? **(b)(5)(iii)**			
Load Distribution			
Is every tank so supported as to prevent the excessive concentration of loads on the supporting portion of the shell? **(b)(5)(iv)**			
Foundations			
Do tanks rest on the ground or on foundations made of concrete, masonry, piling or steel? **(b)(5)(v)**			
Are tank foundations designed to minimize the possibility of uneven settling of the tank and to minimize corrosion in any part of the tank resting on the foundation? **(b)(5)(v)**			
Flood Areas			
If a tank is located in an area that may be subjected to flooding, are the applicable precautions outlined in the following items ((b)(5)(vi)(2-v)) observed? **(b)(5)(vi)**			

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Are all above ground vertical storage tanks containing flammable or combustible liquids located so that the allowable liquid level is always above the established maximum flood stage? **(b)(5)(vi)(a)** **NOTE:** For exceptions to this, see items (m), (n), and (o) in this subdivision.			
Are independent water supply facilities provided at locations where there is no ample and dependable public water supply available for loading partially empty tanks with water? **(b)(5)(vi)(b)**			
In addition to (a) and (b) above, are precautions taken to insure that each tank that is located where more than 70 percent, but less than 100 percent, of its allowable liquid storage will be submerged at the maximum flood stage, is equipped with the following safeguards? **(b)(5)(vi)(c)**			
Is the tank raised or its height increased until its top extends above the maximum flood stage a distance equivalent to 30 percent or more if its allowable liquid storage capacity? **(b)(5)(vi)(c)**			
NOTE: If the safeguard above is implemented, the submerged part of the tank cannot exceed two and one-half times the diameter. As an alternative, adequate noncombustible structural guides, designed to permit the tank to float vertically without loss of product can be provided instead. **(b)(5)(vi)(c)**			
Is each horizontal tank that is located so that more than 70 percent of its capacity is submerged at the established flood stage, anchored or, attached to a foundation of concrete or a combination of steel and concrete of sufficient weight to provide adequate load for the tank when filled with flammable or combustible liquid and submerged by flood waters to the established flood stage? **(b)(5)(vi)(d)**			
If such a concrete or steel and concrete foundation is not used, is the tank adequately secured by other means? **(b)(5)(vi)(d)**			
[RESERVED] **(b)(5)(vi)(e)**			
At locations where there is no ample and dependable water supply or where filling of underground tanks with liquids is impractical because of the character of their contents, their use, or for other reasons, is each tank safeguarded against movement when empty and submerged by high ground water or flood waters by anchoring, weighting with concrete or other approved solid loading material, or secured by other means? **(b)(5)(vi)(f)**			
Is each such tank described above constructed and installed so that it will safely resist external pressures due to high ground water or flood waters? **(b)(5)(vi)(f)**			
Where an ample and dependable water supply is available, are underground tanks used for storage of flammable or combustible liquids that are installed where 70 percent or more of their capacity will be submerged at maximum flood stage, anchored, weighted, or secured so as to prevent movement of such tanks when filled with flammable or combustible liquids, and submerged by flood waters to the established flood stage? **(b)(5)(vi)(g)**			

1910.106 — FLAMMABLE AND COMBUSTIBLE LIQUIDS	YES	NO	N/A
Are pipe connections below the allowable liquid level in a tank provided with valves or cocks located as closely as practicable to the tank shell? **(b)(5)(vi)(h)**			
Are such valves and their connections to tanks made of steel or other material suitable for use with the liquid being stored? Are cast iron fittings prohibited? **(b)(5)(vi)(h)**			
At locations where an independent water supply is required, is it entirely independent of public power and water supply sources? **(b)(5)(vi)(i)**			
Is an independent source of water available when flood waters reach a level not less than 10 feet below the bottom of the lowest tank on a property? **(b)(5)(vi)(i)**			
Is the self-contained power and pumping unit so located or so designed that pumping into tanks may be carried on continuously throughout the rise in flood waters from a level 10 feet below the lowest tank to the level of the potential flood stage? **(b)(5)(vi)(j)**			
Is the capacity of the pumping unit such that the rate of rise of water in all tanks shall be equivalent to the established potential average rate of rise of flood waters at any stage? **(b)(5)(vi)(k)**			
Are procedures established to periodically test the independent pumping units to ensure they are in a satisfactory operating condition? **(b)(5)(vi)(l)**			
Are structural guides for holding floating tanks above their foundations so designed that there will be no resistance to the free rise of a tank? **(b)(5)(vi)(m)**			
Are such structural guides constructed of noncombustible material? **(b)(5)(vi)(m)**			
Is the strength of the structural guides adequate to resist lateral movement of a tank subject to a horizontal force in any direction equivalent to not less than 25 pounds per square foot acting on the projected vertical cross-sectional area of the tank? **(b)(5)(vi)(n)**			
Where tanks are situated on exposed points or bends in a shoreline where swift currents occur, are the structures so designed to withstand a unit force of not less than 50 pounds per square foot? **(b)(5)(vi)(o)**			
Are procedures established whereby the filling of a tank to be protected by water loading is started as soon as flood waters reach a dangerous flood stage? **(b)(5)(vi)(p)**			
Is the rate of filling at least equal to the rise of flood waters? Or the established average potential rate of rise? **(b)(5)(vi)(p)**			
Is sufficient fuel to operate the water pumps available at all times to insure adequate power to fill all tankage with water? **(b)(5)(vi)(q)**			
Are all valves on connecting pipelines closed and locked in a closed position when water loading has been completed? **(b)(5)(vi)(r)**			
Where structural guides are provided for the protection of floating tanks, are all rigid connections between tanks and pipelines disconnected and blanked off or blinded before the flood waters reach the bottom of the tank? **(b)(5)(vi)(s)**			

1910.106 — FLAMMABLE AND COMBUSTIBLE LIQUIDS	YES	NO	N/A
NOTE: Not required if control valves and their connections to the tank are of a type designed to prevent breakage between the valve and the tank shell.			
Are all valves attached to tanks other than those used in connection with water loading closed and locked? **(b)(5)(vi)(t)**			
Is the swing pipe on tanks that are equipped with a swing line, raised and secured at its highest position? **(b)(5)(vi)(u)**			
Inspections The Assistant Secretary or designated representative shall make periodic inspections of all plants where the storage of flammable or combustible liquids is such as to require compliance with the requirements as outlined in part b of this standard. In order to meet OSHA's requirements, does the employer ensure: **(b)(5)(vi)(v)**			
• That all flammable or combustible liquid storage tanks are in compliance with these requirements and so maintained; **(b)(5)(vi)(v)**			
• That detailed printed instructions of what to do in flood emergencies are properly posted; **(b)(5)(vi)(v)** **AND**			
• That station operators and other employees depended upon to carry out such instructions are thoroughly informed as to the location and operation of such valves and other equipment necessary to effect these requirements? **(b)(5)(vi)(v)**			
Earthquake Areas In areas subject to earthquakes, are tank sop ports and connections designed to resist damage as a result of such shocks? **(b)(5)(vii)**			
Sources of Ignition In locations where flammable vapors may be present, are precautions taken to prevent ignition by eliminating or controlling sources of ignition? **(b)(6)**			
Testing Are procedures established whereby all tanks (whether shop built or field erected), will be strength tested before they are placed in service in accordance with the applicable paragraphs of the code under which they were built? **(b)(7)(i)** **NOTE:** The American Society of Mechanical Engineers (ASME) code stamp, American Petroleum Institute (API) monogram, or the label of the Underwriters' Laboratories, Inc. on a tank shall be evidence of compliance with this strength test. Tanks not marked in accordance with the above codes shall be strength tested before they are placed in service in accordance with good engineering principles and reference shall be made to the sections on testing in the codes listed in subparagraphs (1)(iii)(a), (iv)(b), or (v)(b) of this paragraph.			
Is the tank and related piping tested hydrostatically to a pressure equal to the static head that may be imposed when the vertical fill and vent pipes are filled with a liquid that imposes a load in excess of 10 p.s.i. on the tank bottom? **(b)(7)(ii)**			

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YES NO N/A

Are all tanks and connections tested for tightness? (b)(7)(iii)

Except for underground tanks, is this tightness test made at operating pressure with air, inert gas, or water prior to placing the tank in service? (b)(7)(iii)

Are underground tanks and piping tested for tightness hydrostatically, or with air pressure at not less than 3 pounds p.s.i. and not more than 5 p.s.i. prior to being covered, enclosed or placed in use? (b)(7)(iii)

Repairs

Are all leaks or deformations corrected in an acceptable manner before the tank is placed in service? (b)(7)(iv)

> **NOTE**: Mechanical caulking is not permitted for correcting leaks inn welded tanks except pinhole leaks in the roof.

(c) Piping, Valves, and Fittings.

General

Design

Is the design fabrication, assembly, test, and inspection of piping systems containing flammable or combustible liquids suitable for the expected working pressures and structural stresses? (c)(1)(i)

> **NOTE**: Employers can meet OSHA compliance by conforming to the applicable provisions as outlined in *Pressure Piping, ANSI B31* series and in this parargraph.
>
> **EXCEPTIONS**: This paragraph does not apply to any of the following:
>
> - Tubing or casing on any oil or gas wells and any piping connected directly thereto.
> - Motor vehicle, aircraft, boat, or portable or stationary engines.
> - Piping within the scope of any applicable boiler and pressures vessel code. (c)(1)(ii)
>
> **NOTE**: As used in this paragraph, piping systems consist of pipe, tubing, flanges, bolting, gaskets, valves, fittings, the pressure containing parts of other components such as expansion joints and strainers, and devices which serve such purposes as mixing, separating snubbing, distributing, metering and controlled flow. (c)(1)(iii)

Materials for Piping, Valves, and Fittings

Do materials for piping, valves or fittings consist of steel or nodular iron or malleable iron, except as provided in (ii), (iii), and (iv) below? (c)(2)(i)

> **EXCEPTION**: Materials other than steel, nodular iron, or malleable iron may be used underground,or if required by the properties of the flammable or combustible liquid handled. (c)(2)(ii)

Are material other than steel, nodular iron, or malleable iron shall be designed to the specifications embodying principles recognized as good engineering practices for the material used. (c)(2)(ii)

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YES NO N/A

May piping, valves, and fittings have combustible or non combustible linings? (c)(2)(iii)

Low Melting Materials

When low melting point materials or materials that soften on fire exposure, is special consideration given to their behavior on fire exposure? (c)(2)(iv)

If such materials are used in above ground piping or inside buildings, are they suitably protected against fire exposure or so located that any spill resulting from the failure of these materials would not unduly expose persons, important buildings or structures, or can be readily controlled by remote valves? (c)(2)(iv)

Pipe Joints

Are pipe joints made liquid tight? (c)(3)

Are joints made of welding, or screwed joints or approved connectors? (c)(3)

Are threaded joints and connections made up tight with a suitable lubricant or piping compound? (c)(3)

Are pipe joints dependent upon the friction characteristics of combustible materials for mechanical continuity of piping restricted for use inside of buildings? (c)(3)

Where pipe joints depending upon the friction characteristics of combustible materials for mechanical continuity of piping are used outside of buildings above ground, is the piping either secured to prevent disengagement at the fittings, or is the piping system so designed that any spill resulting from such disengagement would not unduly expose persons, important buildings, or structures, and could be readily controlled by remote valves? (c)(3)

Supports

Are piping systems substantially supported and protected against physical damage and excessive stresses arising from settlement, vibration, expansion, or contraction? (c)(4)

Protection Against Corrosion

Is all piping for flammable or combustible liquids, both above ground and underground, where subject to external corrosion, painted or otherwise protected? (c)(5)

Valves

Do piping systems contain a sufficient number of valves to operate the system properly and to protect the plant? (c)(6)

Are piping systems in connection with pumps provided with a sufficient number of valves to control properly the flow of liquid in normal operation and in the event of physical damage? (c)(6)

Is each connection to pipelines where tank cars or tank vehicles discharge liquids by means of pumps into storage tanks equipped with a check valve for automatic protection against back flow if the piping arrangement is such that back flow from the system is possible? (c)(6)

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Testing

Is all piping before being covered, enclosed, or placed in use hydrostatically tested to 150 percent of the maximum anticipated pressure of the system? **(c)(7)**

If piping is pneumatically tested, is it tested to 110 percent of the maximum anticipated pressure of the system, but not less than 5 p.s.i. gage at the highest point of the system? **(c)(7)**

Are these tests maintained for a sufficient time to complete visual inspection of all joints and connections, but for at least 10 minutes? **(c)(7)**

(d) Container and Portable Tank Storage

> **NOTE:** This paragraph applies only to the storage of flammable or combustible liquids in drums or other containers (including flammable aerosols) not exceeding 60 gallons individual capacity and those portable tanks not exceeding 660 gallons individual capacity. **(d)(1)(i)**

This paragraph **does not** apply to:

- Storage of containers in bulk plants, service stations, refineries, chemical plants, and distilleries;
- Flammable liquids in the fuel tanks of motor vehicles, aircraft, boats, or portable or stationary engines;
- Flammable or combustible paints, oils, varnishes, and similar mixtures used for painting or maintenance when not kept for a period in excess of 30 days;
- Beverages when packaged in individual containers not exceeding 1 gallon in size. **(d)(1)(ii)**

Design, Construction, and Capacity of Containers

Are precautions taken to insure that only approved containers and portable tanks are used? **(d)(2)(i)**

Is each portable tank provided with one or more devices installed in the top with sufficient emergency venting capacity to limit internal pressure under fire exposure conditions to 10 p.s.i.g., or 30 percent of the bursting pressure of the tank, whichever is greater? **(d)(2)(ii)**

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Is the total venting capacity not less than that specified in (b)(2)(v) (c) or (e), located on Page H-12? **(d)(2)(ii)**

Is there at least one pressure-actuated vent having a minimum capacity of 6,000 cubic feet of free air used (14.7 p.s.i.a. and 60°F? **(d)(2)(ii)**

Is this pressure-actuated vent set to open at not less than 5 p.s.i.g.? **(d)(2)(ii)**

If fusible vents are used, are they actuated by elements that operate at a temperature not exceeding 300°F? **(d)(2)(ii)**

Size

Do flammable and combustible liquids packaged for sale or use conform to sizes as indicated in Table H-12? **(d)(2)(iii)**

> **NOTE:** Flammable and combustible liquid containers of glass or plastic that have no more than a 1-gallon capacity may be used for a Class 1A or 1B flammable liquid if: **(d)(2)(iii)**

- Such liquid either would be rendered unfit for its intended use by contact with metal or would excessively corrode a metal container so as to create a leakage hazard;

AND

- The user's process either would require more than 1 pint of a Class 1A liquid or more than 1 quart of a Class 1B liquid of a single assay lot to be used at one time, or would require the maintenance of an analytical standard liquid of a quality which is not met by the specified standards of liquids available, and the quantity of the analytical standard liquid required to be used in any one control process exceeds one-sixteenth the capacity of the container allowed under Table H-12 for the class of liquid; **(d)(2)(iii)(a)(ii)**

OR

The containers are intended for direct export outside the United States. **(d)(2)(iii)(b)**

TABLE H-12 — Maximum allowable size of containers and portable tanks

Container type	Flammable liquids			Combustible liquids	
	Class IA	Class IB	Class IC	Class II	Cass III
Glass or approved plastic	1 pt	1 qt	1 gal	1 gal	1 gal.
Metal (other than DOT drums)	1 gal	5 gal	5 gal	5 gal	5 gal.
Safety cans	2 gal	5 gal	5 gal	5 gal	5 gal.
Metal drums (DOT spec.)	60 gal	60 gal	60 gal	60 gal	60 gal.
Approved portable tanks	660 gal	660 gal	660 gal	660 gal	660 gal.

Container exemptions: (a) Medicines, beverages, foodstuffs, cosmetics, and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of § 1010.106 (d)(2)(i) and (ii).

YES NO N/A

Design, Construction, and Capacity of Storage Cabinets

Is the storage of flammable liquids in a cabinet limited to no more than 60 gallons? Is the storage of combustible liquids in a cabinet limited to no more than 120 gallons? **(d)(3)(i)**

Fire Resistance

Are storage cabinets designed and constructed to limit the internal temperature to not more than 325°F when subjected to a 10-minute fire test? **(d)(3)(ii)**

In conducting this fire test is NFPA 251.1969, "Standard Methods of Fire Tests of Building Construction and Materials" used? **(d)(3)(ii)**

During the fire test, do all joints and seams remain tight with the door securely closed? **(d)(3)(ii)**

Are cabinets labeled in conspicuous lettering with the words: "Flammable — Keep Fire Away?" **(d)(3)(ii)**

If metal cabinets are used, are they constructed with the following features: **(d)(3)(ii)(a)**

- The bottom, top, door, and sides of the cabinet at least No. 18 gage sheet iron, and double walled with 1½ inch air space; **(d)(3)(ii)(a)**
- Joints made by riveting, welding, or made tight by some equally effective means; **(d)(3)(ii)(a)**

AND

- The door contains a three-point lock with the door sill raised at least 2 inches above the bottom of the cabinet? **(d)(3)(ii)(a)**

In the event wooden cabinets are used, are they constructed with the following features: **(d)(3)(ii)(b)**

- The bottom, sides, and top constructed of an approved grade of plywood at least 1 inch in thickness, which will not break down or delaminate under fire conditions; **(d)(3)(ii)(b)**
- All joints rabbetted and fastened in two directions with flat head wood screws; **(d)(3)(ii)(b)**
- If more than one door is used, there must be a rabbetted overlap of not less than 1 inch; **(d)(3)(ii)(b)**

AND

- Hinges so installed that they will not lose their holding capacity due to loosening or burning out of the screws when subjected to the fire test? **(d)(3)(ii)(b)**

Design and Construction of Inside Storage Rooms

Are inside storage rooms constructed to meet the required fire resistive rating for their use? **(d)(4)(i)**

Does such construction comply with the test specifications as set forth in *NFPA 251-1969?* **(d)(4)(i)**

Where an automatic sprinkler system is provided, is such system designed and installed in an acceptable manner? **(d)(4)(i)**

Are openings to other rooms or buildings provided with a noncombustible liquid tight raised sill or ramps at least 4 inches in height, or is the floor in the storage area at least 4 inches below the surrounding floor? **(d)(4)(i)**

YES NO N/A

Are such openings provided with approved self-closing fire doors? **(d)(4)(i)**

Is the room liquid tight where the walls join the floors? **(d)(iv)(i)**

Are all windows that may be involved in the construction protected as set forth in the *Standard for Fire Doors and Windows NFPA No. 80-1968,* for Class E or F openings? **(d)(4)(i)**

Does storage in inside storage rooms comply with Table H-13? **(d)(4)(ii)**

TABLE H-13 — Storage in inside rooms

Fire protection provided	Fire resistance	Maximum size	Total allowable quantities gals./sq. ft/ floor area
Yes	2 hrs	500 sq. ft	10
No	2 hrs	500 sq. ft	5
Yes	1 hrs	150 sq. ft	4
No	1 hrs	150 sq. ft	2

*Fire protection system shall be sprinkler, water spray, carbon dioxide, or other system.

Wiring

Does electrical wiring and equipment located in inside storage rooms used for Class I liquids comply with subpart S of this part for Class 1, Division 2 Hazardous locations? **(d)(4)(iii)**

Does electrical wiring and equipment located in inside storage rooms used for Class II and Class III liquids comply with subpart S of this part? **(d)(4)(iii)**

Ventilation

Is each inside storage room provided with either a gravity or a mechanical exhaust ventilation system? **(d)(4)(iv)**

Is each such system designed to provide for a complete change of air within the room at least six times per hour? **(d)(4)(iv)**

Is the switch for a mechanical exhaust system located outside of the door? **(d)(4)(iv)**

Does the switch for the ventilating equipment also activate the lighting fixtures? **(d)(4)(iv)**

Is the switch equipped with a pilot light where Class I flammable liquids are dispensed within the room? **(d)(4)(iv)**

Where gravity ventilation is provided, is the fresh air intake, as well as the exhaust outlet in the exterior of the building in which the room is located? **(d)(4)(iv)**

Storage of Flammables and Combustibles in Inside Storage Rooms

Is each inside storage room provided with a clear aisle at least 3 feet wide, and is the clear aisle maintained? **(d)(4)(v)**

Are containers over 30 gallons in capacity prohibited from being stacked one upon the other? **(d)(4)(v)**

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	YES	NO	N/A
Is any dispensing unit by approved pump or self-closing faucet only? (d)(4)(v)			
Storage of Flammables and Combustibles Inside Buildings			
Are precautions taken to insure that flammable or combustible liquids, including stock for sale, is not stored so as to limit use of exits, stairways, or areas normally used for the safe egress of people? (d)(5)(i)			
Does the storage of flammable or combustible liquids in containers or portable tanks comply with (iii) through (v)? (d)(5)(ii)			
Storage of Flammables and Combustibles Inside Office Occupancies			
Is the storage of flammable or combustible liquids limited to that which is required for maintenance and operation of building and operation of equipment? (d)(5)(iii)			
Are flammable or combustible liquids kept in closed metal containers that are stored in a storage cabinet or in safety cans? (d)(5)(iii)			
Are flammable or combustible liquids stored in metal containers or safety cans that are in an inside storage room not having a door that opens into that portion of the building used by the public? (d)(5)(iii)			
Storing Flammables or Combustibles Inside Mercantile Occupancies and Other Retail Stores			
[RESERVED] (d)(5)(iv)(a-d)			
Are leaking containers removed to a storage room or taken to a safe location outside the building and the contents transferred to an undamaged container? (d)(5)(iv)(e)			
Storage of Flammables and Combustibles in Public Warehouses			
Is the storage of flammable or combustible liquids in public warehouses and in buildings or in portions of buildings cut off by standard firewalls, as required by Table H-14 and H-15? (d)(5)(v)			
NOTE: Materials which do not create a fire hazard to the other stored flammables and combustible liquids may also be stored in the same area. (d)(5)(v)			
Flammable and Combustible Liquid Warehouses or Storage Buildings			
Is there a blank wall having a fire-resistance rating of at least 2 hours provided on a storage building that is located 50 feet or less from a building or line of adjoining property that may be built upon? (d)(5)(vi)(a)			
Although there are no restrictions as to the quantity of liquids stored within a building, does the arrangement of such storage adhere to the requirements of Table H-14 or Table H-15 located on Page H-22? (d)(5)(vi)(b)			
Are flammable and liquid containers in piles separated by pallets or dunnage where necessary to provide stability and to prevent excessive stress on container walls? (d)(5)(iv)(c)			
Are portable tanks stored over one tier high designed to nest securely, without dunnage? (d)(5)(vi)(d)			

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	YES	NO	N/A
Is adequate materials handling equipment available to handle tanks safely at the upper tier level? (d)(5)(vi)(d)			
Are precautions taken to insure that no pile shall be closer than 3 feet to the nearest beam, chord, girder, or other obstruction? (d)(5)(vi)(e)			
Are precautions taken to insure that there is at least 3 feet clearance below sprinkler deflectors or discharge orifices of water spray, or other overhead fire protection systems? (d)(5)(vi)(e)			
Are aisles of at least 3 feet wide provided and maintained where necessary for reasons of access to doors, windows or stand pipe connections? (d)(5)(vi)(f)			
Storage of Flammables and Combustibles Outside of Buildings			
Does outdoor container storage and outdoor portable tank storage comply with Table H-16 or H-17 located on Page H-23? (d)(6)(i)			
Maximum Storage			
NOTE: OSHA allows employers to store a maximum of 1,100 gallons of flammable or combustible liquids adjacent to buildings located on the same premises and under the same management provided that the provisions of (d)(6)(ii)(a-b) of the following subpart are met. However, employers may exceed the 1,100 storage limit providing the following provisions (d)(6)(ii-v) are met.			
If flammable and combustible liquids are located adjacent to buildings on the same property and under the same management, does the employer ensure that: (d)(6)(ii)			
[RESERVED] (d)(6)(ii)(a)			
• A minimum distance of 10 feet is maintained between buildings and the nearest container of flammable or combustible liquids; (d)(6)(ii)(b)			
• The storage area is graded in a manner to divert possible spills away from buildings or other exposures; (d)(6)(iii)			
• The storage area is surrounded by a curb at least 6 inches high; (d)(6)(iii)			
• If curbs are used, provisions are made for draining of accumulations of ground or rain water or spills of flammable or combustible liquids; (d)(6)(iii)			
• Drains terminate at a safe location and are accessible to operation under fire conditions; (d)(6)(iii)			
• Such storage areas protected against tampering or trespassers; (d)(6)(iv)			
AND			
• Such storage areas kept free of weeds, debris and other combustible material not necessary to the storage? (d)(6)(iv)			
Fire Control			
Extinguishers			
Are suitable fire control devices, such as a small hose or portable fire extinguishers available at locations where flammable or combustible liquids are stored? (d)(7)(i)			

TABLE H-14 — Indoor container storage

Class liquid	Storage level	Protected storage maximum per pile Gallons	Unprotected storage maximum per pile Gallons
IA	Ground and upper floors	2,750 (50)	660 (12)
	Basement	Not permitted	Not permitted
IB	Ground and upper floors	5,500 (100)	1,375 (25)
	Basement	Not permitted	Not permitted
IC	Ground and upper floors	16,500 (300)	4,125 (75)
	Basement	Not permitted	Not permitted
II	Ground and upper floors	16,500 (300)	4,125 (75)
	Basement	5,500 (100)	Not permitted
III	Ground and upper floors	55,000 (1,000)	13,750 (250)
	Basement	8,250 (450)	Not permitted

Note 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

Note 2: Aisles shall be provided so that no container is more than 12 ft. from an aisle. Main aisles shall be at least 3 ft. wide and side aisles at least 4 ft. wide.

(Numbers in parentheses indicate corresponding number of 55-gal. drums.)

Note 3: Each pile shall be separated from each other by at least 4 ft.

TABLE H-15 — Indoor portable tank storage

Class liquid	Storage level	Protected storage marimum per pile Gallons	Unprotected storage marimum per pile Gallons
IA	Ground and upper floors	Not permitted	Not permitted
	Basement	Not permitted	Not permitted
IB	Ground and upper floors	20,000	2,000
	Basement	Not permitted	Not permitted
IC	Ground and upper floors	40,000	5,500
	Basement	Not permitted	Not permitted
II	Ground and upper floors	40,000	5,500
	Basement	20,000	Not permitted
III	Ground and upper floors	60,000	22,000
	Basement	20,000	Not permitted

Note 1: When 1 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

Note 2: Aisles shall be provided so that no container is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

(Numbers in parentheses indicate corresponding number of 55-gal. drums.)

Note 3: Each pile shall be separated from each other by at least 4 ft.

TABLE H-16 — Outdoor container storage

1 Class	2 Maximum per pile (see note 1)	3 Distance between piles (see note 2)	4 Distance to property line that can be built upon (see notes 3 and 4)	5 Distnace to street, alley, public way (see note 4)
	gal.	*ft.*	*ft.*	*ft.*
1A	1,100	5	20	10
IB	2,200	5	20	10
IC	4,400	5	20	10
II	8,800	5	10	5
III	22,000	5	10	5

Note 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the 2 or more separate maximum gallonages.

Note 2: Within 200 ft. of each container, there shall be a 12 ft. wide access way to permit approach of fire control apparatus.

Note 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

Note 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

TABLE H-17 — Outdoor portable tank storage

1 Class	2 Maximum per pile	3 Distance between piles	4 Distance to property line that can be built upon	5 Distnace to street, alley, public way
	gal.	*ft.*	*ft.*	*ft.*
1A	2,200	5	20	10
IB	4,400	5	20	10
IC	8,800	5	20	10
II	17,600	5	10	5
III	44,000	5	10	5

Note 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the 2 or more separate maximum gallonages.

Note 2: Within 200 ft. of each container, there shall be a 12 ft. wide access way to permit approach of fire control apparatus.

Note 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

Note 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

YES NO N/A

Is there at least one portable fire extinguisher having a rating of not less than 12-B located outside of, but not more than 10 feet from, the door opening into any room used for storage? (d)(7)(i)(a)

Is there at least one portable fire extinguisher having a rating of not less than 12-B located not less than 10 feet, nor more than 25 feet, from any Class I or II flammable liquid storage area located outside of a storage room but inside a building? (d)(7)(i)(b)

Sprinklers

If sprinklers are provided, are they installed in accordance with 29 CFR 1910.159? (d)(7)(ii)

Open Flames and Smoking

Are open flames and smoking prohibited in flammable or combustible liquid storage areas? (d)(7)(iii)

Water Reactive Materials

Is the storage of materials which will react with water prohibited from being stored in the same room with flammable or combustible liquids? (d)(7)(iv)

(e) Industrial Plants

> **NOTE**: The following items apply where use of flammable or combustible liquids is incidental to the principal business, or where flammable or combustible liquids are handled or used only in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical reaction. The following items do not apply to chemical plants, refineries or distilleries, nor do they apply to portions of such plants which involve chemical reactions such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes. (e)(1)

Incidental Storage or Use of Flammable and Combustible Liquids

Are flammable or combustible liquids stored in tanks or closed containers? (e)(2)(ii)

With the exception of items (b) and (c) below, does all storage comply with paragraphs (d)(3) or (4), located on Page H-20? (e)(2)(ii)(a)

Is the quantity of liquid that may be located outside of an inside storage room or storage cabinet in a building or in any one fire area of a building limited to:

- 25 gallons of Class IA liquids in containers;
- 120 gallons of Class IB, IC, II, or III liquids in containers;
- 660 gallons of Class IB, IC, II, or III liquids in a single portable tank? (e)(2)(ii)(b)

In the event that large quantities of flammable or combustible liquids is necessary, storage in tanks is allowable only if 1910.106(b) — Tank Storage — is complied with. (e)(2)(ii)(c)

YES NO N/A

Separation and Protection

In areas in which flammable or combustible liquids are transferred from one tank or container to another, are such areas separated from other operations in the building by adequate distance or by construction having adequate fire resistance? (e)(2)iii)

Where such liquids are transferred from one tank or container to another, is drainage or other means provided to control spills? (e)(2)(iii)

Is there adequate natural or mechanical ventilation provided? (e)(2)(iii)

Handling Liquids at Point of Final Use

Are flammable liquids kept in covered containers when not actually in use? (e)(2)(iv)(a)

Where flammable or combustible liquids, not in closed containers, are used or handled, are means provided to dispose promptly and safely of leakage or spills? (e)(2)(iv)(b)

Are Class I liquids used only where there are no open flames or other sources of ignition within the possible path of vapor travel? (e)(2)(iv)(c)

Are flammable or combustible liquids drawn from or transferred into vessels, containers, or portable tanks within a building only through one of the following methods: (e)(2)(iv)(d)

- A closed piping system;
- From safety cans;
- By means of a device drawing through the top;

AND

- From the container or portable tank by gravity through an approved self-closing valve? (e)(2)(iv)(d)

Is transferring by means of air pressure on the container or portable tanks prohibited? (e)(2)(iv)(d)

Unit Physical Operations

> **NOTE**: The following items are applicable in those portions of industrial plants where flammable or combustible liquids are handled or used in unit physical operations such as mixing, drying, evaporating, filtering, distillation, and similar operations which do not involve chemical change. (e)(3)(i)

Location

Are industrial plants where unit physical operation. as outlined above, is accomplished, so located so that each building or unit of equipment is accessible from at least one side for fire fighting and fire control purposes? (e)(3)(ii)

Are buildings located with respect to property lines? (e)(3)(ii)

Do such buildings meet the requirements of paragraph (h)(2)(i-ii) of this section with the exception that the blank wall has a fire resistance rating of at least 2 hours? (e)(3)(ii)

1910.106 — FLAMMABLE AND COMBUSTIBLE LIQUIDS	**YES**	**NO**	**N/A**
Chemical Processes			
Are areas where unstable liquids are handled or small scale unit chemical processes are carried on, separated from the remainder of the plant by a fire wall of 2-hour minimum fire resistance rating? **(e)(3)(iii)**			
Drainage			
Are emergency drainage systems provided to direct flammable or combustible liquid leakage and fire protection water to a safe location? **(e)(3)(iv)(a)**			
If this drainage system requires curbs, scuppers, or special drainage systems to control the spread of fire, is 1910.106(b)(2)(vii)(b), located on Page H-13 complied with? **(e)(3)(iv)(a)**			
Are emergency drainage systems that are connected to public sewers or discharged into public waterways, equipped with traps or separators? **(e)(3)(iv)(b)**			
Ventilation			
Are areas involving unit physical operations ventilated at a rate of not less than 1 cubic foot per minute per square foot of solid floor area? **(e)(3)(v)(a)**			
Is this ventilation accomplished by natural or mechanical ventilation with discharge or exhaust to a safe location outside of the building? **(e)(3)(v)(a)**			
Are proper provisions made for introduction of makeup air in such a manner as not to short circuit the ventilation? **(e)(3)(v)(a)**			
Is ventilation installed and arranged to include all floor areas or pits where flammable vapors may collect? **(e)(3)(v)(a)**			
Is the equipment used in a building and the ventilation of the building designed so as to limit flammable vapor-air mixtures under normal operating conditions to the interior of equipment? **(e)(3)(v)(b)**			
Is the equipment and ventilation of the building designed so as to prevent the area within 5 feet from the equipment from being exposed to Class I liquids to the air? **(e)(3)(v)(b)** **NOTE**: Some examples of such equipment are dispensing stations, open centrifuges, plate and frame filters, open vacuum filters, and surfaces of open equipment.			
Storage and Handling			
Does the storage, transfer, and handling of liquids comply with items contained in 106.(h)(4) of this check sheet? **(e)(3)(vi)**			
Tank Vehicle and Tank Car Loading and Unloading			
Are tank vehicle and tank car loading or unloading facilities separated from above ground tanks, warehouse, and other plant buildings or the nearest line of adjoining property which may be built upon, by a distance of 25 feet for Class I liquids, and 15 feet for Class II and Class III liquids measured from the nearest position of any fill stem? **(e)(4)(i)** **NOTE**:Buildings for pumps or shelters for personnel may be a part of the facility. Operations of the facility shall comply with the appropriate portions of paragraph (f)(3) of this section.			

1910.106 — FLAMMABLE AND COMBUSTIBLE LIQUIDS	**YES**	**NO**	**N/A**
Fire Control			
Is portable fire extinguishment and control equipment provided in such quantities and types as are needed for the special hazards of operation and storage? **(e)(5)(i)**			
Is sufficient water available in volume and at adequate pressure to supply water hose streams, foam-producing equipment, automatic sprinklers, or water spray systems as the need is indicated? **(e)(5)(ii)**			
Is special extinguishing equipment such as that utilizing foam, inert gas, or dry chemical provided as the need is indicated? **(e)(5)(iii)**			
Where the need is indicated by special hazards of operations, is flammable or combustible liquid processing equipment, major piping, and supporting steel protected by approved water spray systems, deluge systems, approved fire resistant coatings insulation or any combination of these? **(e)(5)(iv)**			
Maintenance			
Are all plant fire protection facilities adequately maintained and periodically inspected and tested to make sure that they are always in satisfactory operating condition, and that they will serve their purpose in time of emergency? **(e)(5)(v)**			
Sources of Ignition			
Are adequate precautions taken to prevent the ignition of flammable vapors through open flames; lightning; smoking; cutting and welding; hot surfaces; frictional heat; static; electrical and mechanical sparks; spontaneous ignition, including heat-producing chemical reactions; and radiant heat? **(e)(6)(i)**			
Are precautions taken to insure that Class I liquids are not dispensed into containers unless the nozzle and container are electrically interconnected? **(e)(6)(ii)**			
Electrical			
Equipment			
Is all electrical wiring and equipment installed according to the requirements of subpart S of these regulations? **(e)(7)(i)(a)**			
Are all locations where flammable vapor-air mixtures may exist under normal operating conditions classified as Class I, Division 1 according to the requirements of subpart S? **(e)(7)(i)(b)**			
Does the Division 1 area extend at least 5 feet in all directions from all points of vapor liberation for equipments as listed in items (3)(v)(b) of this check sheet? **(e)(7)(i)(b)**			
Are all areas within pits classified as Division 1 if any part of the pit is within a Division 1 or 2 of the classified area? **(e)(7)(i)(b)** **EXCEPTION**: Unless the pit is provided with mechanical ventilation.			
Are those locations where flammable vapor-air mixtures may exist under abnormal conditions classified Division 2 according to the requirements of subpart S of this part? **(e)(7)(i)(c)**			
Do these locations include an area within 20 feet horizontally, 3 feet vertically beyond a Division 1 area, and up to 3 feet above floor or grade level within 25 feet, if indoors, or 10 feet if outdoors, from any pomp, bleeder, withdrawal fitting meter, or similar device handling Class I liquids? **(e)(7)(i)(c)**			

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	YES	NO	N/A
Are pits that are provided with adequate mechanical ventilation within a Division 1 or 2 area classified as Division 2? (e)(7)(i)(c)			
If Class II or Class III liquids only are handled, does the electrical equipment comply with subpart S of these requirements? (e)(7)(i)(c)			
If ordinary electrical equipment including switch gear is used, is it installed in a room or enclosure which is maintained under positive press ore with respect to the hazardous area? (e)(7)(i)(d)			
Is the ventilation used to maintain the positive pressure made up of air uncontaminated by flammable vapors? (e)(7)(i)(d)			
Repairs to Equipment			
Is hot work, such as welding or cutting operations, use of spark-producing power tools, and chipping operations permitted only under the supervision of an individual in responsible charge? (e)(8)			
Is such individual required to make an inspection of the area to be sure that it is safe for the work to be done and that safe procedures will be followed for the work specified? (e)(8)			
Housekeeping			
Are there established procedures for maintenance and operating practices which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids? (e)(9)(i)			
Are spills cleaned up promptly? (e)(9)(i)			
Are adequate aisles provided and maintained for unobstructed movement of personnel, and so that fire protection equipment can be brought to bear on any part of flammable or combustible liquid storage, use, or any unit physical operation? (e)(9)(ii)			
Are procedures established whereby combustible waste material and residues in a building or unit operating area is kept to a minimum? (e)(9)(iii)			
Is such waste material and residues stored in covered metal receptacles and disposed of daily? (e)(9)(iii)			
Is the ground area around buildings and unit operating areas kept free of weeds, trash, or other unnecessary combustible materials? (e)(9)(iv)			
(f) Bulk Plants			
Storage			
Are Class I liquids stored in closed containers, or in storage tanks above ground outside of buildings, or underground in accordance with the applicable provisions in 1910.106(b) of this check sheet? (f)(1)(i)			
Are Class II and Class III liquids stored in containers, or in tanks within buildings or above ground outside of buildings, or underground in accordance with the applicable provisions of 1910.106(b)? (f)(1)(ii)			
When piling containers of flammable or combustible liquids one upon the other, are they separated by Dunn age sufficient to provide stability and to prevent excessive stress on container walls? (f)(1)(iii)			

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	YES	NO	N/A
Is the height of the pile consistent with the stability and strength of containers? (f)(1)(iii)			
Buildings			
Are rooms in which flammable or combustible liquids stored or handled by pumps equipped with exit facilities arranged to prevent occupants from being trapped in the event of fire? (f)(2)(i)			
Are rooms in which Class I liquids are stored or handled heated only by means not constituting a source of ignition such as steam or hot water? (f)(2)(ii)			
Are rooms containing heating appliances involving sources of ignition located and arranged to prevent entry of flammable vapors? (f)(2)(ii)			
Ventilation			
Is ventilation provided for all rooms, buildings, or enclosures in which Class I liquids are pumped or dispensed? (f)(2)(iii)(a)			
Does the design of ventilation systems take into account the relatively high specific gravity of the vapors? (f)(2)(iii)(a)			
Is mechanical ventilation provided where natural ventilation is inadequate? (f)(2)(iii)(a)			
Is the handling or storage of Class I liquids prohibited within a building having a basement or pit into which flammable vapors may travel? (f)(2)(iii)(b) **EXCEPTION:** Unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.			
Are precautions taken to insure that containers of Class I liquids will not be drawn from or filled where there is no provision for preventing the accumulation of flammable vapors? (f)(2)(iii)(c)			
If mechanical ventilation is required to comply with the item immediately above, are precautions taken to insure that it is kept in operation while flammable liquids are being handled? (f)(2)(iii)(c)			
Loading and Unloading Facilities			
Are tank vehicle and tank car loading or unloading facilities for Class I liquids separated from above ground tanks, warehouses, other plant buildings or nearest line of adjoining property that may be built upon by a distance of 25 feet? (f)(3)(i)			
Are tank vehicle and tank car loading or unloading facilities for Class II or Class III liquids separated from above ground tanks, warehouses, other plant building or the nearest line of adjoining property that may be built upon by a distance of 15 feet? (f)(3)(i)			
Are precautions taken so that equipment, such as piping, pumps, and meters used for the transfer of Class I liquids between storage tanks and the fill stem of the loading rack will not be used for the transfer of Class II or Class III liquids? (f)(3)(ii)			
Are the valves used for the final control for filling tank vehicles of the self-closing type, and manually held open except where automatic means are provided for shutting off the flow when the vehicle is full or after filling of a preset amount? (f)(3)(iii)			

Static Protection

Are bonding facilities for protection against static sparks during the loading of tank vehicles through open domes provided in the following instances:

- Where Class I liquids are loaded; (f)(3)(iv)(a)

AND

- Where Class II or Class III liquids are loaded into vehicles which may contain vapors from previous cargoes of Class I liquids? (f)(3)(iv)(a)

Does the bonding protection as required in item (a) immediately above consist of a metallic bond wire permanently electrically connected to the fill stem or to some part of the rack structure in electrical contact with the fill stem? (f)(3)(iv)(b)

Is the free end of such wire provided with a clamp or equivalent device for convenient attachment to some metallic part in electrical contact with the cargo tank of the tank vehicle? (f)(3)(iv)(b)

Are procedures established whereby the bonding connection will be made fast to the vehicle or tank before dome covers are raised, and shall remain in place until filling is completed and all dome covers have been closed and secured? (f)(3)(iv)(c)

> **EXCEPTION:** Bonding as specified in (a),(b), and (c) above is not required where vehicles are loaded exclusively with products not having a static accumulating tendency, such as asphalt, most crude oils, residual oils, and water soluble liquids. Bonding is also not required where no Class I liquids are handled at the loading facility and the tank vehicles loaded are used exclusively for Class II and Class III liquids and where vehicles are loaded or unloaded through closed bottom or top connections. (f)(3)(iv)(d)

Is the filling through open domes into the tanks of tank vehicles or cars, that contain vapor-air mixtures within the flammable range or where the liquid being filled can form such a mixture, accomplished by means of a down spout which extends near the bottom of the tank? (f)(3)(iv)(e)

Stray Currents

Are tank car loading facilities where Class I liquids are loaded through open domes protected against stray currents by bonding the pipe to at least one rail and to the rack structure if of metal? (f)(3)(v)

Are multiple lines entering the rack area electrically bonded together? (f)(3)(v)

Where excessive stray currents are known to exist, is all pipe entering the rack area provided with insulating sections to electrically isolate the rack piping from the pipelines? (f)(3)(v)

Are procedures established whereby Class I liquids will not be dispensed into containers unless the nozzle and container are electrically interconnected? (f)(3)(vi)

Wharves

DEFINITION and APPLICATION: The term wharf shall mean any wharf, pier, bulkhead or other structure over or adjacent to navigable water used in conjunction with a bulk plant.

The following items pertain to the transfer of flammable or combustible liquid cargo in bulk between the bulk plant and any tank vessel, ship, barge, lighter boat, or other mobile floating craft, The items in this check sheet do not apply to Marine Service Stations as covered in 1910.106(9). (f)(4)(i)

[RESERVED] (f)(4)(ii-iii)

Is the substructure and deck of the wharf substantially designed for the use intended? (f)(4)(vi)

Are loading pumps capable of building up pressure of cargo hose or loading arms provided with bypasses, relief valves, or other arrangement to protect the loading facilities against excessive pressure? (f)(4)(vi)

Are such relief devices tested at not more than yearly intervals to determine that they function satisfactorily at the pressure at which they are set? (f)(4)(vi)

Are appropriate inspections made of all pressure hoses and couplings? (f)(4)(vii)

Are procedures established whereby the hose and couplings will be tested with the hose extended, and using the "in service maximum operating pressures"? (f)(4)(vii)

Is all hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings withdrawn from service and repaired or discarded? (f)(4)(vii)

Do piping, valves and fittings comply with the requirements of items listed in 1910.106(c), located on Page H-18

The following items in the checklist (a-i) contain exceptions and additions to 1910.106(c): (f)(4)(viii)

- Is the flexibility of piping such that by appropriate layout and arrangement of piping supports, the motion of the wharf structure resulting from wave action, currents, tides, or the mooring of vessels will not subject the pipe to repeated strain beyond the elastic limit? (f)(4)(viii)(a)
- Are pipe joints that depend upon the friction characteristics of combustible materials or growing of pipe ends for mechanical continuity of piping prohibited? (f)(4)(viii)(b)
- Are swivel joints that may be used in piping to which hoses are connected, and for articulated swivel-joint transfer systems, designed in such a way that the mechanical strength of the joint will not be impaired if the packing material should fall, as by exposure to fire? (f)(4)(viii)(c)
- Do piping systems contain a sufficient number of valves to operate the system properly and to control the flow of liquid in normal operation and in the event of physical damage? (f)(4)(viii)(d)

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	YES	NO	N/A
• In addition to item (d) above, is each line conveying flammable liquids leading to a wharf provided with a readily accessible block valve located on shore near the approach to the wharf and outside of any diked area? **(f)(4)(viii)(e)**			
• Where more than one line is involved, are valves grouped in one location? **(f)(4)(viii)(e)**			
• Is there an easy means of access provided for cargo valves located below the wharf deck? **(f)(4)(viii)(f)**			
• Are pipelines on flammable or combustible liquid wharves adequately bonded and grounded? **(f)(4)(viii)(g)**			
• Are insulated joints installed where excessive stray currents are encountered? **(f)(4)(viii)(g)**			
• Are bonding connections and grounding connections on all pipelines located on wharf side of hose-riser insulation flanges, and are they accessible for inspection? **(f)(4)(viii)(g)**			
• Are hose or articulated swivel joint pipe connections used for cargo transfer capable of accommodating the combined effects of change in draft and maximum tidal range? **(f)(4)(viii)(h)**			
• Are mooring lines kept adjusted to prevent the surge of the vessel from placing stress on the cargo transfer system? **(f)(4)(viii)(h)**			
• Is hose supported so as to avoid kinking and damages from chafing? **(f)(4)(viii)(i)**			
Fire Protection			
Are suitable portable fire extinguishers with a rating of not less than 12-BC located within 75 feet of those portions of the facility where fires are likely to occur, such as those connections, pomps. and separator tanks? **(f)(4)(ix)**			
Where piped water is available, is there ready-connected fire hose in size appropriate for the water sop ply provided, so that manifolds where connections are made and broken can be reached by at least one hose stream? **(f)(4)(ix)(a)**			
Is material prohibited from being placed on wharves in such a manner as to obstruct access to fire fighting equipment, or important pipeline control valves? **(f)(4)(ix)(b)**			
Where the wharf is accessible to vehicle traffic, is there an unobstructed roadway to the shore end of the wharf maintained for access of fire fighting apparatus? **(f)(4)(ix)(c)**			
Are provisions made so that loading or discharging will not commence until the wharf superintendent and officer in charge of the tank vessel agree that the tank vessel is properly moored and all connections are properly made? **(f)(4)(x)**			
Is mechanical work prohibited on the wharf during cargo transfer? **(f)(4)(x)**			
Electrical Equipment			
NOTE: This subparagraph shall apply to areas where Class I liquids are stored and handled. For areas where Class II or III liquids only are stored and handled, the electrical equipment may be installed in accordance with the provisions of Subpart S, for ordinary locations. **(f)(5)(i)**			

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	YES	NO	N/A
Is all electrical equipment and wiring of a type specified by and installed in accordance with subpart S of this part? **(f)(5)(ii)**			
Is Table H-18 located on Page H-30 used to delineate and classify hazardous areas for the purpose of installation of electrical equipment under normal circumstances? **(f)(5)(iii)**			
Are precautions taken when a classified area is established in accordance with Table H-18, that it shall not extend beyond an unpierced wall, roof, or other solid partition? **(f)(5)(iii)**			
Are area classifications based on the premise that the installation meets the applicable requirements of this section in all respects? **(f)(5)(iii)**			
Sources of Ignition			
Are precautions taken to prevent Class I liquids from being handled. drawn, or dispensed where flammable vapors may reach a source of ignition? **(f)(6)**			
Is smoking prohibited except in designated localities? **(f)(6)**			
Are "No Smoking" signs conspicuously posted where hazard from flammable liquid vapors is normally present? **(f)(6)**			
Drainage and Waste Disposal			
Are provisions made to prevent flammable or combustible liquids which may be spilled at loading or unloading points from entering public sewers and drainage systems, or natural waterways? **(f)(7)**			
Are connections to sewers, drains, or waterways by which flammable or combustible liquids might enter provided with separator boxes or other approved means whereby such entry is prevented? **(f)(7)**			
Are precautions taken to insure that flammable or combustible liquids will not be dumped into sewers, but will be stored in tanks or tight drums outside of any building until removed from the premises? **(f)(7)**			
Fire Control			
Are suitable fire control devices, such as small hose or portable fire extinguishers available to locations where fires are likely to occur? **(f)(8)**			
Is additional fire-control equipment required and available where a tank of more than 50,000 gallons capacity contains Class I liquids, and where an unusual exposure hazard exists from surrounding property? **(f)(8)**			
Is the additional fire control equipment of sufficient size to extinguish a fire in the largest tank?			
(g) Service Stations			
Storage and Handling General Provisions			
Are liquids stored in one of the following approved ways: **(g)(1)(i)(a)**			
• In approved closed containers not exceeding 60 gallons capacity; **(g)(1)(i)(a)**			

YES NO N/A

- In tanks located underground; (g)(1)(i)(a)

AND

- In tanks located in special enclosures, as described in 1910.106(g)(i), or in above ground tanks as provided in 1910.106(g)(4)(ii) (b), (c), and (d), the items for which will follow in the normal sequence of this checklist? (g)(1)(i)(a)

Where a service station underground tank is connected to an above ground tank at an adjoining bulk plant, is there a valve installed within control of the service station personnel? (g)(1)(i)(b)

Is the dispensing of Class I liquids into fuel tanks of motor vehicles of the public prohibited at a bulk plant? (g)(1)(i)(c)

> **EXCEPTION:** Unless separated by a fence or similar harrier from the area in which bulk operations are conducted.

[RESERVED] (g)(1)(i)(d)

Where flammable liquids are dispensed from a tank vehicle in the open, to a motor vehicle, are the following items complied with: (g)(1)(i)(e)

- The tank vehicle complies with the requirements covered in the Standard on Tank Vehicles for Flammable Liquids, NFPA 385-1966; (g)(1)(i)(e)(1)
- The dispensing accomplished on premises is not open to the public; (g)(1)(i)(e)(2)
- **[RESERVED]** (g)(1)(i)(e)(3)
- The dispensing hose is not more than 50 feet in length; (g)(1)(i)(e)(4)

AND

- The dispensing nozzle is a listed automatic-closing type without a latch-open device? (g)(1)(i)(e)(5)

Are precautions taken to insure that Class I liquids are not stored or handled within a building having a basement or pit into which flammable vapors may travel? (g)(1)(i)(f)

> **EXCEPTION:** Unless such an area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

[RESERVED] (g)(1)(i)(g)

Are accurate inventory records maintained and reconciled on all Class I liquid storage tanks for possible indication of leakage from tanks or piping? (g)(1)(i)(g)

Special Enclosures

If it is impractical to install tanks in accordance with 1910.106(b)(3) because of property or building limitations, do tanks for flammable or combustible liquids have the proper enclosure? (g)(1)(ii)(a)

Is the enclosure substantially liquid and vapor tight without backfill? (g)(1)(ii)(b)

Are the sides, top, and bottom of the enclosure of reinforced concrete at least 6 inches thick? (g)(1)(ii)(b)

YES NO N/A

Are there openings for inspection through the top only? (g)(1)(ii)(b)

Are tank connections so piped or closed that neither vapors nor liquid can escape into the enclosed space? (g)(1)(ii)(b)

Are means provided whereby portable equipment may be employed to discharge to the outside any liquid or vapors which might accumulate should leakage occur? (g)(1)(ii)(b)

Inside Buildings

Except where stored in tanks as provided in item (ii) above, are Class I liquids prohibited from being stored within any service station building, except in closed containers of a total capacity not exceeding 60 gallons? (g)(1)(iii)(a)

Is only one container not exceeding 60 gallons capacity equipped with an approved pump permitted? (g)(1)(iii)(a)

Where Class I liquids may be transferred from one container to another in lubrication or service rooms of a service station building, is the electrical installation in compliance with Table H-19, located on Page H-31, and does the heating equipment comply with 1910.106(g)(6) which follows in a normal sequence in this checklist? (g)(1)(iii)(b)

Are Class II and Class III liquids stored and dispensed inside service station buildings from tanks of not more than 120 gallons capacity each? (g)(1)(iii)(c)

[RESERVED] (g)(1)(iv)

Is the delivery of any Class I liquids prohibited, except when made into portable containers constructed of metal that have a tight closure with screwed or spring cover that is fitted with a spout or so designed that the contents can be poured without spilling? (g)(1)(v)

[RESERVED] (g)(2)

Dispensing Systems

Are all dispensing devices at automotive service stations so located that all pans of the vehicle being serviced will be on the premises of the service station? (g)(3)(i)

Where approved dispensing units may be located inside of buildings, is the dispensing area separated from other areas in an approved manner? (g)(3)(ii)

Is the dispensing unit and its piping mounted either on a concrete island or protected against collision damage by suitable means, and located in a position where it cannot be struck by a vehicle descending a ramp or other slope out of control? (g)(3)(ii)

Is the dispensing area provided with an approved mechanical or gravity ventilation system? (g)(3)(ii)

When dispensing units are located below grade is only approved mechanical ventilation used and the entire dispensing area protected by an approved automatic sprinkler system? (g)(3)(ii)

Is the ventilating system electrically interlocked with gasoline dispensing units so that the dispensing units cannot be operated unless the ventilating tan motors are energized? (g)(3)(ii)

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TABLE H-18 — Electrical equipment hazardous areas — bulk plants

Location	Class I Group D division	Extent of classified area
Tank vehicle and tank car:[1]		
Loading through open dome	1	Within 3 feet of edge of dome, extending in all directions.
	2	Area between 3 feet and 5 feet from edge of dome, extending in all directions.
Loading through bottom connections with atmospheric venting.	1	Within 3 feet of point of venting to atmosphere extending in all directions.
	2	Area between 3 feet and 5 feet from point of venting to atmoshpere, extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of loading connection.
Loading through closed dome with atmospheric venting.	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet from open end of vent, extending in all directions. Also within 3 feet of edge of dome, extending in all directions.
Loading through closed dome with vapor recovery	2	Within 3 feet of point of connection of both fill and vapor lines, extending in all directions.
Bottom loading with vapor recovery or any bottom unloading.	2	Within 3 feet of point of connections extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of connection.
Drum and container filling:		
Outdoors, or indoors with adequate ventilation.	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Tank — Aboveground:		
Shell, ends, or roof and dike area	2	Within 10 feet from shell, ends, or roof of tank, Area inside dikes to level of top of dike.
Vent	1	Within 5 feet of open end of vent, extending in all directions.
	2	Area between 5 feet and 10 feet from open end of vent, extending in all directions.
Floading roof	1	Area above the roof and within the shell.
Pits:		
Without mechanical ventilation	1	Entire area within pit if any part is within a Division 1 or 2 Classified area.
With mechanical ventilation	2	Entire area within pit if any part is within a Division 1 or 2 Classified area.
Containing valves, fittings or piping, and not within a Division 1 or 2 classified area.	2	Entire pit.
Pumps, bleeders, withdrawal fittings, meters and similar devices:		
Indoors	2	Within 5 feet of any edge of such devices, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of such devices
Outdoors	2	Within 3 feet of any edge of such devices, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of such devices
Storage and repair garage for tank vehicles	1	All pits or spaces below floor level.
	2	Area up to 18 inches above floor or grade level for entire storage or repair garage.
Drainage ditches, separators, impounding basins.	2	Area up to 18 inches above ditch, separator or basin. Also up to 18 inches above grade within 15 feet horizontally from any edge.
Garages for other than tank vehicles	(2)	If there is any opening to these rooms within the extent of an outdoor classified area, the entire room shall be classified the same as the area classification at the point of the opening.
Outdoor drum storage	(2)	
Indoor warehousing where there is no flammble liquid transfer.	(2)	If there is any opening to these rooms within the extent of an indoor classified area, the room shall be classified the same as if the wall, curb or partition did not exist.
Office and rest rooms	(2)	

[1] When classifying the extent of the area, consideration shall be given to the fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

TABLE H-19 — Electrical equipment hazardous areas — service stations

Location	Class I Group D division	Extent of classified area
Underground tank:		
Full opening	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
	2	Up to 18 inches above grade level within a horizontal radius of 10 feet from a loose fill connection and within a horizontal radius of 5 feet from a tight fill connection.
Vent-Discharging upward	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet of open end of vent, extending in all directions.
Dispenser:		
Pits	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
Dispensser enclosure	1	The area 4 feet vertically above base within the enclosure and 18 inches horizontally in all directions.
Outdoor	2	Up to 18 inches above grade level within 20 feet horizontally of any edge of enclosure.
Indoor:		
With mechanical ventilation	2	Up to 18 inches above grade or floor level within 20 feet horizontally of any edge of enclosure.
With gravity ventilation	2	Up to 18 inches above grade or floor level within 25 feet horizontally of any edge of enclosure.
Remote pump-Outdoor	1	Any pit, box oar space below grade level if any part is within a horizontal distance of 10 feet from any edge of pump.
	2	Within 3 feet of any edge of pump, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of pump.
Remote pump-Indoor	1	Entire area within any pit.
	2	Within 5 feet of any edge of pump, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of pump.
Lubrication or service room	1	Entire area within any pit.
	2	Area up to 18 inches above floor or grade level within entire lubrication room.
Dispenser for Class I liquids	2	Within 3 feet of any fill or dispensing point, extending in all directions.
Special enclosure inside building per § 1910.106 (f)(1)(ii).	1	Entire enclosure.
Sales, storage and rest rooms	Ordinary (1)	If there is any opening to these rooms within the extent of a Division 1 area, the entire room shall be classified as Division 1.

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	YES	NO	N/A
Emergency Power Cutoff			
Are clearly identified and easily accessible switch(es) or a circuit breaker(s) provided at a location remote from dispensing devices, including remote pumping systems, to shut off the power to all dispensing devices in the event of an emergency? (g)(3)(iii)			
Dispensing Units			
Are Class I liquids transferred from tanks by means of fixed pumps so designed and equipped as to allow control of the flow and to prevent leakage or accidental discharge? (g)(3)(iv)(a)			
Are only listed devices used for dispensing Class I liquids? (g)(3)(iv)(b)(1)			
Is any device that shows evidence of having been dismantled, prohibited from being used? (g)(3)(iv)(b)(1)			
Are procedures established whereby after December 31, 1978 every dispensing device for Class I liquids will contain evidence of listing, so placed that any attempt to dismantle the device will result in damage to such evidence visibly without disassembly or dismantling of the nozzle? (g)(3)(iv)(b)(2)			
Are Class I liquids prohibited from being dispensed by pressure from drums, barrels, and similar containers? (g)(3)(iv)(c)			
Are only approved pumps taking suction through the top of the container or approved self-closing faucets used? (g)(3)(iv)(c)			
Are dispensing units, except those attached to containers, mounted either on a concrete island or protected against collision damage by suitable means? (g)(3)(iv)(d)			
Remote Pumping Systems			
NOTE: The following items (b) through (f) apply to the dispensing of Class I liquids, where the liquids are transferred from storage to individual or multiple dispensing units by pumps located elsewhere than at the dispensing units. (g)(3)(v)(a)			
Are pumps designed or equipped so that no part of the system will be subjected to pressures above its allowable working pressure? (g)(3)(v)(b)			
Are pumps that are installed abovegrade, outside of buildings, located not less than 10 feet from the lines of adjoining property which may be built upon, and not less than 5 feet from any building opening? (g)(3)(v)(b)			
Where pumps are located inside of buildings, are the requirements of 1910.106(g)(3)(ii), located on Page H-29, complied with?			
Are such inside pumps located in pits as provided in the following item (c) of this checklist? (g)(3)(v)(b)			
Are pumps substantially anchored and protected against physical damage by vehicles? (g)(3)(v)(b)			
Will pits for subsurface pumps or piping manifolds of submersible pumps withstand the external forces to which they may be subjected without damage to the pump, tank, or piping? (g)(3)(v)(c)			

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	YES	NO	N/A
Is the pit no larger than necessary for inspection and maintenance and is it provided with a fitted cover? (g)(3)(v)(c)			
Does the pump operate only when a dispensing nozzle is removed from its bracket on the dispensing unit and the switch on this dispensing unit is manually actuated? (g)(3)(v)(d)			
Does this control also stop the pump when all nozzles have been returned to their brackets? (g)(3)(v)(d)			
Is there an approved impact valve, incorporating a fusible link designed to close automatically in the event of severe impact or fire exposure properly installed in the dispensing supply line at the base of each individual dispensing device? (g)(3)(v)(e)			
Does this approved impact valve incorporate a fusible link? (g)(3)(v)(e)			
Testing			
Upon completion of the installation, including any paving, is the pressure piping system between the pump discharge and the connection for the dispensing facility, tested for at least 30 minutes at the maximum operating pressure of the system? (g)(3)(v)(f)			
Are such tests scheduled to be repeated at 5-year intervals thereafter? (g)(3)(v)(f)			
Delivery Nozzles			
Is a listed manual or automatic-closing type hose nozzle valve provided on dispensers used for the dispensing of Class I liquids? (g)(3)(vi)(a)			
Are manual-closing type valves held open manually during dispensing? (g)(3)(vi)(b)			
NOTE: Automatic-closing type valves may be used in conjunction with an approved latch-open device. (g)(3)(vi)(b)			
Marine Service Stations			
Dispensing			
Is the dispensing area located away from other structures so as to provide room for safe ingress and egress of craft to be fueled? (g)(4)(i)(a)			
Are the dispensing units at least 20 feet from any activity involving fixed sources of ignition? (g)(4)(i)(a)			
Is dispensing made by approved dispensing units With or without integral pumps? (g)(4)(i)(b)			
Are dispensing nozzles of the automatic-closing type without a hold-open latch? (g)(4)(i)(c)			
Tanks and Pumps			
Are tanks and pumps that are not integral with the dispensing unit, located on shore or a pier of the solid fill type, except as provided in item (b) below? (g)(4)(ii)(a)			
Do tanks that are installed on a pier because of an excessively long supply line to a dispenser, comply with the applicable portions of 1910.106(b) relative to spacing, diking and piping? (g)(4)(ii)(b)			

YES NO N/A

Are these tanks as indicated in the above item, limited to 1,100 gallons capacity? (g)(4)(ii)(b)

> **NOTE:** Shore tanks supplying marine service stations may be located above ground, where rock ledges or high water tables make underground tanks impractical. (g)(4)(ii)(c)

Are tanks that are at an elevation which would produce gravity head on the dispensing unit, equipped with a pressure control valve so adjusted that liquid cannot flow by gravity from the tank in case of piping or hose failure? (g)(4)(ii)(d)

Piping

Does the piping between shore tanks and dispensing units comply with the items contained in 1910.106(c) of this checklist? (g)(4)(iii)(a)

Are readily accessible valves provided in each pipeline at or near the approach to the pier, and at the shore end of each pipeline adjacent to the point where flexible hose is attached? (g)(4)(iii)(b)

Is all piping located so as to be protected from physical damage? (g)(4)(iii)(c)

Is all piping that handles Class I liquids provided with a grounding circuit to control stray currents? (g)(4)(iii)(d)

Electrical Equipment

Is all electrical equipment and wiring of the type specified by, and is it installed in accordance with subpart S of this part? (g)(5)(ii)

Insofar as it applies, is Table H-19 use to delineate and classify hazardous locations for the purpose of installing electrical equipment? (g)(5)(iii)

Heating Equipment

> **NOTE:** Heating equipment shall be installed as required in paragraphs (g)(6)(ii-v) of this part.

If a special room for heating equipment is provided, is there a wall having a fire resistance rating of at least 1 hour provided for separation from an area classified by Table H-19? (g)(6)(iii)

Is this 1-hour fire resistive wall without any openings within 8 feet of the floor into the area classified in the Tables? (g)(6)(iii)

Is the storage of combustible materials prohibited in this special room? (g)(6)(iii)

Does all air for combustion purposes come from the outside of the building? (g)(6)(iii)

Work Areas

If heating equipment is installed in the lubrication, sales, or service room, where there is no dispensing or transferring of Class I liquids, is there at least 18 inches between the floor and the combustion chamber? (g)(6)(iv)

Is the heating equipment referred to above protected from physical damage by vehicles? (g)(6)(iv)

YES NO N/A

Is heating equipment that uses gas or oil fuel that is listed for uses in garages, installed in the lubrication or service room where Class I liquids are dispensed, installed at least 8 feet above the floor? (g)(6)(iv)

Does all electrical heating equipment conform to the items listed in 1910.106(g)(5) above? (g)(6)(v)

Draining and Waste Disposal

Are provisions made whereby Class I liquid spills are prohibited from flowing into the interior of service station buildings? (g)(7)

Are crankcase trainings and flammable of combustible liquids prohibited from being dumped into sewers? (g)(7)

Sources of Ignition

Is smoking or the use of open flame work prohibited in the areas used for fueling, servicing fuel systems for internal combustion engines, receiving or dispensing of flammable or combustible liquids? (g)(8)

Are conspicuous and legible signs prohibiting smoking posted within sight of the customer being served? (g)(8)

Are the motors of all equipment being fueled required to be shut off during the fueling operation? (g)(8)

Fire Control

Are there sufficient fire extinguishers with a 6B, C rating located so that there will be one extinguisher within 75 feet of each pump, dispenser, underground fill pipe opening. and lubrication or service room? (g)(9)

(h) Processing Plants

> **NOTE:** The following items apply to those plants or buildings which contain chemical operations such as oxidation, reduction, halogenation, hydrogenation, alkylation, polymerization, and other chemical processes. This section does not apply to chemical plants, refineries or distilleries. (h)(1)

Is the location of each processing vessel based upon its flammable or combustible liquid capacity? (h)(2)(i)

Processing Building

Construction

Do processing buildings have a fire-resistance or noncombustible construction? (h)(3)(i)(a)

> **NOTE:** Heavy timber construction with load-bearing walls are permitted for plants utilizing only stable Class II or Class III liquids.

Are load-bearing walls prohibited? (h)(3)(i)(a)

Are buildings without basements or covered pits? (h)(3)(i)(a)

Do all areas have adequate exit facilities so arranged to prevent occupants from being trapped in the event of fire? (h)(3)(i)(b)

Are precautions taken to prevent the exposure of the exits to the drainage facilities, as described in the following items? (h)(3)(i)(b)

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	YES	NO	N/A
Drainage			
Are there emergency drainage systems provided to direct flammable or combustible liquid leakage and fire protection water to a safe location? **(h)(3)(ii)(a)**			
If this drainage system requires curbs, scuppers, or special drainage, are they in accordance with the items listed in 1910.106(b)(2)(vii)(b), located on Page H-13. **(h)(3)(ii)(a)**			
Are those emergency drainage systems that are connected to public sewers or discharged into public waterways, equipped with traps or separators? **(h)(3)(ii)(b)**			
Ventilation			
Are enclosed processing buildings ventilated at a rate of not less than 1 cubic foot per minute per square foot of solid floor area? **(h)(3)(iii)(a)**			
Is this ventilation accomplished by natural or mechanical ventilation with a discharge or exhaust to a safe location outside of the building? **(h)(3)(iii)(a)**			
Are provisions made for introduction of makeup air in such a manner so as not to short circuit the ventilation? **(h)(3)(iii)(a)**			
Is the equipment used in the building and the ventilation of the building so designed so as to limit flammable vapor-air mixtures under normal operating conditions to the interior of equipment. and to not more than 5 feet from equipment which exposes Class I liquids to the air? **(h)(3)(iii)(b)**			
Explosion Relief			
In areas where Class IA or unstable liquids are processed, is explosion venting accomplished through one or more of the following methods: **(h)(3)(iv)**			
• Open air construction; **(h)(3)(iv)(a)**			
• Lightweight walls and roof; **(h)(3)(iv)(b)**			
• Lightweight wall panels and roof hatches; **(h)(3)(iv)(c)** **AND**			
• Windows of explosion venting type? **(h)(3)(iv)(d)**			
Liquid Handling *Storage*			
Is the storage of flammable or combustible liquids in tanks in accordance with the applicable provisions of paragraph b of this checklist? **(h)(4)(i)(a)**			
If the storage of flammable or combustible liquids in out. side above ground or underground tanks is not practical, are tanks inside of buildings or structures in accordance with the applicable provisions of paragraph (b) of this section, and the items in that paragraph in this checklist? On Page H-10. **(h)(4)(i)(b)**			
Are the storage tanks inside of buildings only in areas at or above grade which have adequate drainage, and are they separated from the processing area by construction having a fire resistance rating of at least 2 hours? **(h)(4)(i)(c)**			
Is the storage of flammable or combustible liquids in containers in accordance with paragraph (d) and the items of that paragraph in this checklist? **(h)(4)(i)(d)**			

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	YES	NO	N/A
Piping, Values, and Fittings			
Does all piping, valves, and fittings comply with paragraph (c), and the items of that paragraph in this checklist on Page H-18? **(h)(4)(ii)(a)** **NOTE:** Approved flexible connectors may be used where vibration exists or where frequent movement is necessary. Approved hose may be at transfer stations. **(h)(4)(ii)(b)**			
Is all piping containing flammable or combustible liquids identified? **(h)(4)(ii)(c)**			
Transfer			
Is the transfer of large quantities of flammable or combustible liquids accomplished through piping by means of pumps or water displacement? **(h)(4)(iii)(a)**			
Is the transfer of large quantities of flammable or combustible liquids by means of gravity prohibited? **(h)(4)(iii)(a)**			
Is the use of compressed air as a transferring medium prohibited? **(h)(4)(iii)(a)**			
On positive displacement pumps, are they provided with pressure relief discharging back to the tank or to pump suction? **(h)(4)(iii)(b)**			
Equipment			
Is all equipment designed and arranged to prevent the unintentional escape of liquids and vapors, and to minimize the quantity escaping in the event of accidental release? **(h)(4)(iv)(a)**			
Where the vapor space of equipment is usually within the flammable range, and where the special hazards of operation, sources of ignition, or exposures indicate a need, is consideration given to providing protection by one or more of the following means: **(h)(4)(iv)(b)** • Limiting the explosive atmosphere by inerting; • Providing an explosion suppression system; **AND** • Designing the equipment to contain the peak explosion pressure which may be modified by explosion relief? **(h)(4)(iv)(b)**			
Tank Vehicle and Tank Car Loading and Unloading			
Are tank vehicle and tank car loading or unloading facilities separated from above ground tanks, warehouses, other plant buildings, or nearest property line by a distance of 25 feet for Class I liquids, by a distance of 15 feet for Class II and Class III liquids, measured from the nearest position of any stem? **(h)(5)**			
Do operations of the loading and unloading facility comply with the appropriate portions of paragraph (f)(3) of this section and the items listed on Page H-26 of this section? **(h)(5)**			
Fire Control			
Are approved portable fire extinguishers of appropriate size, type, and number provided? **(h)(6)(i)**			

YES NO N/A

Where the special hazards of operation or exposure indicate a need, are the following methods of fire control provided: **(h)(6)(ii)**

- Is there a reliable water supply available in pressure and quantity adequate to meet the probable fire demands? **(h)(6)(ii)(a)**
- Are hydrants provided in accordance with accepted good practice? **(h)(6)(ii)(c)**
- Is fire hose connected to a source of water installed so that all vessels, pumps, and other equipment containing flammable or combustible liquids can be reached with at least one hose stream? **(h)(6)(ii)(c)**
- Are nozzles that are capable of discharging a water spray provided? **(h)(6)(ii)(c)**
- Is there an approved automatic sprinkler system or equivalent extinguishing system provided for all processing plants? **(h)(6)(ii)(d)**

AND

- If the special extinguishing system consists of such things as foam, carbon dioxide, or dry chemical, is the equipment approved and installed in an approved manner? **(h)(6)(ii)(d)**

Alarm Systems

Is there an approved means for prompt notification of fire to those within the plant and any public fire department provided? **(h)(6)(iii)**

Maintenance

Are all plant fire protection facilities adequately maintained and periodically inspected and tested? **(h)(6)(iv)**

Sources of Ignition

Are suitable precautions taken to prevent the ignition of flammable vapors? **(h)(7)(i)(a)**

If Class I liquids are dispensed into containers is the nozzle and container electrically interconnected? **(h)(7)(i)(b)**

> **NOTE:** To comply with the provisions of this section, the employer must ensure that either the metallic floorplate on which the container stands while filling is electrically connected to the fill stem or the fill stem is bonded to the container during filling operations by means of bond wire.

Maintenance and Repair

Is all maintenance work in a flammable or combustible liquid processing area accomplished only when authorized by a responsible representative of the employer? **(h)(7)(ii)(a)**

Is hot work permitted only under the supervision of an individual in responsible charge who has made an inspection of the area to ensure that the area is safe for the work to be done and that safe procedures will be followed for the work specified? **(h)(7)(ii)(b)**

Is all electrical wiring and equipment within storage or processing areas installed in accordance with nationally recognized good practice? **(h)(7)(iii)(a)**

YES NO N/A

Are all electrical installations where flammable vapor-air mixtures may exist under normal operating conditions, that are classified Class I, Division 1, made in accordance with the requirements of subpart S of this part? **(h)(7)(iii)(b)**

Does the Division 1 area classification extend 5 feet in all directions from all points of vapor liberation? **(h)(7)(iii)(b)**

Are all areas within pits classified Division 1 if any of the pit is within a Division 1 or 2 classified area? **(h)(7)(iii)(b)**

> **EXCEPTION:** Unless the pit is provided with mechanical ventilation.

In locations where flammable vapor-air mixtures may exist under abnormal conditions. and for a distance beyond the Division 1 location, are they classified Division 2 in accordance with the requirements of subpart S? **(h)(7)(iii)(c)**

Dues this Division 2 area classification include all within 20 feet horizontally, 3 feet vertically beyond a Division 1 area, and up to 3 feet above floor or grade level within 25 feet, if indoors, or 10 feet if outdoors, from any pump, bleeder, withdrawal fitting, meter, or similar device handling Class I liquids? **(h)(7)(iii)(c)**

If ordinary electrical equipment including switchgear is used in any of the areas as classified in paragraphs (h)(7)(iii)(a-c), is the electrical equipment installed in a room or enclosure which is maintained under positive pressure with respect to the hazardous area? **(h)(7)(iii)(d)**

Is ventilation makeup air into this room uncontaminated by flammable vapors? **(h)(7)(iii)(d)**

Housekeeping

Are maintenance and operating procedures established which will tend to control leakage and prevent the accidental escape of flammable or combustible liquids? **(h)(8)(i)**

Are spills cleaned up promptly? **(h)(8)(i)**

Are adequate aisles maintained for unobstructed movement of personnel, and so that any fire protection equipment can be brought to bear on any part of the processing equipment? **(h)(8)(ii)**

Is combustible waste material and residues in a building or operating area kept to a minimum? **(h)(8)(iii)**

Is combustible waste material and residues stored in a closed metal waste can, and disposed of daily? **(h)(8)(iii)**

Is the ground area around buildings and operating areas kept free of tall grass, weeds, trash, or other combustible materials? **(h)(8)(iv)**

(i) Refineries, Chemical Plants, and Distilleries, Storage Tanks

Storage Tanks

Are flammable or combustible liquids stored in tanks. containers, or in portable tanks? **(i)(1)**

Are tanks installed in accordance with 1910.106(b), located on Page H-10 of this checklist? **(i)(1)**

Are tanks for the storage of flammable or combustible liquids in tank farms and in locations other than process areas in accordance with the items in this checklist under paragraph (b)(2)(ii) on Page H-11 of this checklist? **(i)(1)**

1910.106 — FLAMMABLE AND COMBUSTIBLE LIQUIDS

YES NO N/A

Wharves

Are wharves handling flammable or combustible liquids in accordance with the items in paragraph (f)(4) of this section on Page H-27 complied with? (i)(2)

Fired and Unfired Pressure Vessels — Fired Vessels

Are fired pressure vessels constructed in accordance with the Code for Fired Pressure Vessels, Section I of the ASME Boiler and Pressure Vessel Code — 1968? (i)(3)(i)

Are on fired pressure vessels constructed in accordance with the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code — 1968? (i)(3)(i)

Location and Process Units

Are process units located so that they are accessible from at least one side for the purpose of fire control? (i)(4)

Fire Control

Is portable fire extinguishment and control equipment provided in such quantities and types as are needed for the special hazards of operation and storage? (i)(5)(i)

Is water available in volume and at adequate pressure to supply water hose streams, foam-producing equipment, automatic sprinklers, or water spray systems as the need is indicated? (i)(5)(ii)

Is special extinguishing equipment provided as the need is indicated by the special hazards of operation and storage? (i)(5)(iii)

(j) Scope

This section applies to the handling, storage and use of flammable and combustible liquids with a flash point below 200°F.

This section does not apply to:

(1) Bulk transportation of flammable or combustible liquids.

(2) Storage, handling, and use of fuel oil tanks and containers connected with oil burning equipment.

(3) Storage of flammable and combustible liquids on farms.

(4) Liquids without flashpoints that may be flammable under some conditions, such as certain halogenated hydrocarbons and mixtures containing halogenated hydrocarbons.

(5) Mists, sprays or foams, except flammable aerosols covered in paragraph (d) of this section.

(6) Installations made in accordance with the requirements of the following standards:

- (i) NFPA Standards for Dry Cleaning plants, NFPA No. 32-970
- (ii) NFPA Standard for the Manufacture of Organic Coatings, NFPA No. 35-1970.
- (iii) NFPA Standard for Solvent Extraction Plans, NFPA No. 36-1967.
- (iv) NFPA Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA No. 37-1970 (j)

1910.107 — SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

YES NO N/A

(a) Definitions Applicable to this Section.

This section applies to flammable and combustible finishing materials when applied as a spray by compressed air, "airless" or "hydraulic atomization," steam, electrostatic methods, or by any other means in continuous or intermittent processes.

This section also covers the application of combustible powders by powder spray guns, electrostatic powder spray guns, fluidized beds, or electrostatic fluidized beds.

The section **does not** apply to outdoor spray application of buildings, tanks, or other similar structures, nor to small portable spraying apparatus not used repeatedly in the same location. (a)

(b) Spray Booths.

Construction (b)(1)

Are spray booths constructed by one of the following methods?

Of steel securely and rigidly supported, of concrete or masonry, or if intermittent or low volume spraying is used, of aluminum or other substantial noncombustible material? (b)(1)

Are spray booths designed to sweep air currents toward the exhaust outlet? (b)(1)

Interiors (b)(2)

Is the interior surface of spray booths smooth and continuous without edges and otherwise designed to prevent pocketing of residues and to facilitate cleaning and washing without injury? (b)(2)

Floors (b)(3)

If the floor surface of a spray booth is combustible, is the operator's working area covered with noncombustible material of such character as to facilitate the safe cleaning and removal of residues? (b)(3)

Distribution or Baffle Plates (b)(4)

If distribution or baffle plates are installed are they of noncombustible material and readily removable or accessible on both sides for cleaning? (b)(4)

Are distribution or baffle plates prohibited from being located in exhaust ducts? (b)(4)

Dry-Type Overspray Collectors — Exhaust Air Filters (b)(5)

If overspray dry filters or filter rolls are installed in conventional dry-type spray booths, do they conform to the following items? (b)(5)

Is the spray operation, except electrostatic spraying, so designed, installed and maintained to provide an average air velocity over the open face of the booth of not less than 100 linear feet per minute? (b)(5)(i)

Are electrostatic spraying operations so designed, installed and maintained so that the average air velocity over the oper face of the booth is not less than 60 linear feet per minute? (b)(5)(i)

Are visible gauges or is an audible alarm or pressure activated device installed to indicate or insure that the required air velocity is maintained? (b)(5)(i)

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(b) Spray Booths.

	YES	NO
Are filter rolls inspected to insure proper replacement of filter media? (b)(5)(i)		
Are all discarded filter pads and filter rolls immediately removed to a safe, well-detached location or placed in a water-filled metal container? (b)(5)(ii)		
Are all discarded filter pads and filter rolls disposed of at the close of the day's operations unless maintained completely in water? (b)(5)(ii)		
Is the location of filters in a spray booth made so as to not reduce the effective booth enclosure of the articles being sprayed? (b)(5)(iii)		
Is the space within the spray booth on the downstream and upstream sides of filters protected with approved automatic sprinklers? (b)(5)(iv)		
Is the use of filters or filter rolls prohibited when applying a spray material known to be highly susceptible to spontaneous heating and ignition? (b)(5)(v)		
Are all clean filters or filter rolls noncombustible or of a type having a combustibility not in excess of Class 2 filters as listed by the Underwriters' Laboratories, Inc.? (b)(5)(vi)		
Where the combination of materials may be conducive to spontaneous ignition, are precautions taken to eliminate filters and filter rolls from being used on these combinations? (b)(5)(vi)		
Frontal Area. (b)(6)		
On spray booths having a frontal area larger than 9 square feet, is a metal deflector or curtain not less than 2½ inches deep installed at the upper outer edge of the booth over the opening? (b)(6)		
Conveyors. (b)(7)		
Where conveyors are arranged to carry work into or out of spray booths, are the openings therefor as small as practical? (b)(7)		
Separation of Operations. (b)(8)		
Is each spray booth separated from other operations by at least 3 feet, or separated by a partition or a wall, so as to reduce the danger from juxtaposition of hazardous operations? (b)(8)		
Cleaning. (b)(9)		
Are spray booths so installed that all portions are readily accessible for cleaning? (b)(9)		
Is there a clear space of at least 3 feet on all sides, and is this clear space kept free from storage or combustible construction? (b)(9)		
Illumination. (b)(10)		
If spraying areas are illuminated through glass panels or other transparent materials, are only fixed lighting units used as a source of illumination? (b)(10)		
Do these panels effectively isolate the spraying area from the area in which the lighting unit is located? (b)(10)		

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

(b) Spray Booths.

	YES	NO
Are these panels of a noncombustible material of such a nature, or so protected, that breakage will not be caused? (b)(10)		
Are these panels so arranged that normal accumulations of residue on the exposed surface will not be raised to a dangerous temperature by radiation or conduction from the source of illumination? (b)(10)		
(c) Electrical and Other Sources of Ignition.		
Conformance. (c)(1)		
Except as provided in (c)(1)(i), (ii), (iii), and (iv), does all electrical equipment, open flames and other sources of ignition conform to the requirements of (c)(2) through (9) of this checklist? (c)(1)		
Does electrostatic apparatus conform to the requirements of paragraphs (h) and (i) of this section, the items of which follow in normal sequence? (c)(1)(i)		
Does the drying, curing, and fusion apparatus conform to the requirements of paragraph (j) of this section, which items follow in normal sequence? (c)(1)(ii)		
Do automobile undercoating spray operations in garages conform to the requirements of paragraph (k) of this section, which items follow in normal sequence? (c)(1)(iii)		
Does powder coating equipment conform to the requirements of paragraph (1) of this section, which items follow in normal sequence? (c)(1)(iv)		
Minimum Separation. (c)(2)		
Are open flames or spark-producing equipment prohibited in any spraying area, or within 20 feet thereof, unless separated by a partition? (c)(2)		
Hot Surfaces. (c)(3)		
Is the installation of space-heating appliances, steampipes, or hot surfaces prohibited in a spraying area where deposits of combustible residues may readily accumulate? (c)(3)		
Wiring Conformance. (c)(4)		
Is all electrical wiring and equipment in conformance with the provisions of this paragraph, in addition to complying with subpart S of this part? (c)(4)		
Combustible Residue Areas. (c)(5)		
Is all electrical equipment in any spraying area prohibited, unless it is specifically approved for locations containing both deposits of readily ignitable residue and explosive vapors? (c)(5)		
Exception: Wiring in rigid conduit or in boxes or fittings containing no taps, splices, or terminal connections.		
Wiring Type Approved. (c)(6)		
Is all electrical wiring and equipment in a spraying area of the explosion-proof type approved for Class I, group D locations, and does it otherwise conform to the provisions of subpart S of this part, for Class I, Division 1, Hazardous Locations? (c)(6)		

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

(c) Electrical and Other Sorces of Ignition.

YES | NO

Are precautions taken to insure that electrical wiring, motors, and other equipment outside of but within 20 feet of any spraying area, and not separated therefrom by partitions, will not produce sparks under normal operating conditions, and otherwise conform to the provisions of subpart S of this part for Class I, Division 2 Hazardous Locations? (c)(6)

Lamps. (c)(7)

Are electric lamps outside of, but within 20 feet of any spraying area, and not separated therefrom by a partition, totally enclosed to prevent the falling of hot particles and are they protected from mechanical injury by suitable guards or by location? (c)(7)

Portable Lamps. (c)(8)

Are portable electric lamps prohibited from being used in any spraying area during spraying operations? (c)(8)

Are portable electric lamps, if used during cleaning or repairing operations, of the type approved for hazardous Class I locations? (c)(8)

Grounding. (c)(9)

Are all metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids properly electrically grounded in an effective and permanent manner? (c)(9)(i)

(d) Ventilation.

Conformance. (d)(1)

Are ventilating and exhaust systems in accordance with the Standard for Blower and Exhaust Systems for Vapor Removal, NFPA No. 91-1961? (d)(1)

Are ventilating and exhaust systems in conformance with the following items of this checklist? (d)(1)

General. (d)(2)

Are all spraying areas provided with mechanical ventilation adequate to remove flammable vapors, mists, or powders to a safe location and to confine and control combustible residues so that life or property is not endangered? (d)(2)

Are precautions taken to insure that mechanical ventilation is kept in operation at all times while spraying operations are being conducted, and for a sufficient time thereafter to allow vapors from drying coated articles and drying finishing material residue to be exhausted? (d)(2)

Independent Exhaust. (d)(3)

Does each spray booth have an independent exhaust duct system discharging to the exterior of the building? (d)(3)

Exception: Multiple cabinet spray booths in which identical spray finishing material is used with a combined frontal area of not more than 18 square feet may have a common exhaust.

If more than one fan serves one booth, are provisions made so that fans are so interconnected that one fan cannot operate without all fans being operated? (d)(3)

Fan-Rotating Element. (d)(4)

Is the fan-rotating element constructed of nonferrous or nonsparking material? (d)(4)

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

(d) Ventilation.

YES | NO

As an alternate to the above item, does the casing consist of, or is it lined with nonferrous or nonsparking material? (d)(4)

Is there ample clearance between the fan-rotating element and the fan casing to avoid a fire by friction? (d)(4)

Are fan blades mounted on a shaft sufficiently heavy to maintain perfect alignment, even when the blades of the fan are heavily loaded? (d)(4)

Are all shaft bearings of the self-lubricating type, or are they lubricated from the outside only? (d)(4)

Electric Motors. (d)(5)

Are electric motors driving exhaust fans prohibited from being placed inside booths or ducts? (d)(5)

Belts. (d)(6)

Are belts prohibited from entering the duct or booth unless the belt and pulley within the duct or booth are thoroughly enclosed? (d)(6)

Exhaust Ducts. (d)(7)

Are all exhaust ducts constructed of steel, and are they substantially supported? (d)(7)

If exhaust ducts are provided with dampers, are they installed and maintained so that they will be in a full open position at all times the ventilating system is in operation? (d)(7)

Are exhaust ducts protected against mechanical damage, and is there at least 18" clearance from unprotected combustible construction or other combustible material? (d)(7)(i)

If exhaust ducts are of combustible construction, and the protection is provided in (a) through (d) below, are precautions taken to insure that the clearances are at least as indicated in each item:

(a) Where 28-gage sheet metal is mounted on ¼-inch asbestos mill board, distance 12 inches?
(b) Where 28-gage sheet metal is mounted on 1/8-inch asbestos mill board spaced out 1 inch on noncombustible spacers, distance 9 inches?
(c) Where 22-gage sheet metal is mounted on 1-inch rockwood batts reinforced with wire mesh or the equivalent, distance 3 inches?
(d) Where ducts are protected with an approved automatic sprinkler system, properly maintained, the distance may be reduced to 6 inches? (d)(7)(ii)

Discharge Clearance. (d)(8)

With the exception of exhaust ducting from a water-wash spray booth, is the terminal of the exhaust at least 6 feet from any combustible exterior wall or roof? (d)(8)

With the exception of exhaust ducting from a water-wash spray booth, is the exhaust duct terminal so located that it will not discharge in the direction of any combustible construction or unprotected opening in any noncombustible exterior wall within 25 feet? (d)(8)

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

(d) Ventilation.

	YES	NO
Air Exhaust. (d)(9)		
Are precautions taken to insure that air exhausted from spray operations is not directed so that it will contaminate makeup air being introduced into the spraying area or other ventilating intakes? (d)(9)		
Are precautions taken to insure that air exhausted from spray operations is not recirculated? (d)(9)		
Access Doors. (d)(10)		
In order to facilitate cleaning, are exhaust ducts provided with an ample number of access doors? (d)(10)		
Room Intakes. (d)(11)		
Are there sufficient air intake openings in rooms containing spray finishing operations to provide for the adequate operation of the exhaust fans, and are they so located as to minimize the creation of dead air pockets? (d)(11)		
Drying Spaces. (d)(12)		
Are all freshly sprayed articles dried only in spaces provided with adequate ventilation to prevent the formation of explosive vapors? (d)(12)		
If the spaces for drying freshly sprayed articles are not equipped with ventilation, are such spaces considered to be spraying areas? (d)(12)		
(e) Flammable and Combustible Liquids – Storage and Handling.		
Conformance. (e)(1)		
Is the storage of flammable or combustible liquids in connection with spraying operations in accordance with the requirements of 1910.106, the items of which begin on page H-08 of this checklist?		
Quantity. (e)(2)		
Is the quantity of flammable or combustible liquids kept in the vicinity of spraying operations confined to that which would ordinarily not exceed a supply for 1 day or one shift? (e)(2)		
Is bulk storage of portable containers of flammable or combustible liquids in a separate, constructed building detached from other important buildings? (e)(2)		
Containers. (e)(3)		
Are original closed containers, approved portable tanks, approved safety cans or a properly arranged system of piping, the only method for bringing flammable or combustible liquids into spray finishing rooms? (e)(3)		
Are open or glass containers prohibited? (e)(3)		
Transferring Liquids. (e)(4)		
Is all withdrawal of flammable and combustible liquids from containers having a capacity of greater than 60 gallons, accomplished by an approved pump? (e)(4)		
Exception: Except as provided in the items listed in subparagraph (5) below.		
Is the withdrawal of flammable and combustible liquids from containers, and the filling of containers, including portable mixing tanks, accomplished only in a suitable mixing room or in a spraying area when the ventilating system is in operation? (e)(4)		

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

(e) Flammable and Combustible Liquids – Storage and Handling.

	YES	NO
Are adequate precautions taken to protect against liquid spillage and sources of ignition? (e)(4)		
Spraying Containers. (e)(5)		
Are containers supplying spray nozzles of the closed type or are they provided with metal covers kept closed? (e)(5)		
Are containers supplying spray nozzles resting on floors, or are they on metal supports or suspended by wire cables? (e)(5)		
Are containers supplying spray nozzles by gravity flow limited to 10 gallons capacity? (e)(5)		
Are original shipping containers supplying spray nozzles prohibited from being subjected to air pressure for supplying the spray nozzles? (e)(5)		
Are containers under air pressure supplying spray nozzles of a limited capacity, not exceeding that necessary for 1-day's operation? (e)(5)		
Are containers under air pressure supplying spray nozzles provided with a visible pressure gage? (e)(5)		
Are containers under air pressure supplying spray nozzles provided with a relief valve set to operate in conformance with the requirements of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code-1968? (e)(5)		
Do containers under air pressure supplying spray nozzles, air-storage tanks and coolers conform to the standards of the Code for Unfired Pressure Vessels, Section VIII of the ASME Boiler and Pressure Vessel Code-1968 for construction, tests, and maintenance? (e)(5)		
Pipes and Hoses. (e)(6)		
Are all containers or piping to which is attached a hose or flexible connection provided with a shutoff valve at the connection? (e)(6)(i)		
Are such valves kept shut when spraying operations are not being conducted? (e)(6)(i)		
When pumps are used to deliver products, are automatic means provided to prevent pressure in excess of the design working pressure of accessories, piping, and hose? (e)(6)(ii)		
Is all pressure hose and couplings inspected at regular intervals appropriate to the service? (e)(6)(iii)		
Are the hose and couplings tested with the hose extended, and using the "inservice maximum operating pressures?" (e)(6)(iii)		
Is any hose showing material deteriorations, signs of leakage, or weakness in its carcass or at the couplings, withdrawn from the service and repaired or discarded? (e)(6)(iii)		
Are piping systems conveying flammable or combustible liquids made of steel or other material having comparable properties of resistance to heat and physical damage? (e)(6)(iv)		
Are piping systems properly bonded and grounded? (e)(6)(iv)		
Spray Liquid Heaters. (e)(7)		
Are electrically powered spray liquid heaters approved and listed for the specific location in which used? (e)(7)		

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

(e) Flammable and Combustible Liquids – Storage and Handling.

YES NO

Are electric heaters prohibited from being located in spray booths or other locations subject to accumulation of deposits or combustible residue? (e)(7)

If an electric motor is used to power agitators, is it in accordance with the items under 1910.107(c) in this checklist on page H-31? (e)(7)

Pump Relief. (e)(8)

Where flammable or combustible liquids are supplied to spray nozzles by positive displacement pumps, is the pump discharge line provided with an approved relief valve discharging to a pump suction or a safe detached location, or is a device provided to stop the prime mover if the discharge pressure exceeds the safe operating pressure of the system? (e)(8)

Grounding. (e)(9)

Where flammable or combustible liquids are transferred from one container to the other, are both containers effectively bonded and grounded? (e)(9)

(f) Protection.

Conformance. (f)(1)

In sprinklered buildings, does the automatic sprinkler system in rooms containing spray finishing operations conform to the requirements of 1910.159? (f)(1)

In unsprinklered buildings where sprinklers are installed only to protect spraying areas, does the installation conform to such standards insofar as they are applicable? (f)(1)

Are sprinkler heads located so as to provide water distribution throughout the entire booth. (f)(1)

Are sprinkler heads so located to effect water distribution throughout the entire booth? (f)(1)

Valve Access. (f)(2)

Are automatic sprinklers protecting each spray booth and its connecting exhaust, provided with an accessibly located separate outside stem and yoke (OS&Y) sub-control valve? (f)(2)

Cleaning of Heads. (f)(3)

Are sprinklers protecting spray areas kept free from deposits by cleaning daily if necessary? (f)(3)

Portable Extinguishers. (f)(4)

Is there an adequate supply of suitable portable fire extinguishers installed near all spraying areas? (f)(4)

(g) Operations and Maintenance.

Spraying. (g)(1)

Is spraying prohibited from being conducted outside of predetermined spraying areas? (g)(1)

Cleaning. (g)(2)

Are all spraying areas kept free from the accumulation of deposits of combustible residues? (g)(2)

Are scrapers, spuds, or other such tools used for cleaning purposes of nonsparking material? (g)(2)

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

(g) Operations and Maintenance.

YES NO

Residue Disposal. (g)(3)

Are residue scrapings and debris contaminated with residue immediately removed from the premises and properly disposed of? (g)(3)

Are approved metal waste cans provided wherever rags or waste are impregnated with finishing material? (g)(3)

Are all such rags or waste deposited in the approved waste cans immediately? (g)(3)

Are the contents of waste cans properly disposed of at least once daily, or at the end of each shift? (g)(3)

Clothing Storage. (g)(4)

Are spray finishing employees' clothing prohibited from being left on the premises overnight unless kept in metal lockers? (g)(4)

Cleaning Solvents. (g)(5)

Is the general use of solvents for cleaning purposes restricted to those having flashpoints not less than 100°F.? (g)(5)

Exception: For cleaning spray nozzles and auxiliary equipment, solvents having flashpoints not less than those normally used in spray operations can be used.

Is such cleaning conducted inside the spray booth, and is ventilating equipment operated during the cleaning period? (g)(5)

Hazardous Materials Combinations. (g)(6)

Are precautions taken to insure that spray booths are not alternately used for different types of coating materials, where the combination of the materials may be conducive to spontaneous ignition? (g)(6)

If spray booths are alternately used for different types of coating materials, where the combination of the materials may be conducive to spontaneous ignition, are all deposits of the first used material removed from the booth and exhaust ducts prior to spraying with the second used material? (g)(6)

"No Smoking" Signs. (g)(7)

Are "No Smoking" signs in large letters on contrasting color background conspicuously posted at all spraying areas and paint storage rooms? (g)(7)

(h) Fixed Electrostatic Apparatus.

Conformance. (h)(1)

Where installation and use of electrostatic spraying equipment is used, does such installation and use conform to all other paragraphs of this section, and in addition to the requirements of the following items? (h)(1)

Type Approval. (h)(2)

Is the electrostatic apparatus and devices used in connection with coating operations of the approved type? (h)(2)

Location. (h)(3)

With the exception of high-voltage grids, electrodes, and electrostatic atomizing heads and their connections, are transformers, power packs, control apparatus, and all other electrical portions of the equipment located outside of the spraying area, or do they otherwise conform to the requirements of paragraph (c) of this section, the items of which are on page H-31 of this checklist? (h)(3)

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS

(h) Fixed Electrostatic Apparatus.

	YES	NO
Support. (h)(4)		
Are electrodes and electrostatic atomizing heads adequately supported in permanent locations, and are they effectively insulated from the ground? (h)(4)		
Are insulators of a nonporous and noncombustible material? (h)(4)		
Insulators, Grounding. (h)(5)		
Are high-voltage leads to electrodes properly insulated and protected from mechanical injury or exposure to destructive chemicals? (h)(5)		
Are electrostatic atomizing heads effectively and permanently supported on suitable insulators, and are they effectively guarded against accidental contact or grounding? (h)(5)		
Is there an automatic means provided for grounding the electrode system when it is electrically deenergized for any reason? (h)(5)		
Are all insulators kept in a clean and dry condition? (h)(5)		
Safe Distance. (h)(6)		
Is the distance between goods being painted and electrodes or electrostatic atomizing heads or conductors at least twice the sparking distance? (h)(6)		
Is there a suitable sign indicating this safe distance conspicuously posted near the assembly? (h)(6)		
Conveyors Required. (h)(7)		
Are conveyors used that will support the goods being painted using this process? (h)(7)		
Are the conveyors that are used so arranged as to maintain safe distances between the goods and the electrodes or electrostatic atomizing heads at all times? (h)(7)		
Are irregularly shaped goods or others subject to possible swinging or movement, rigidly supported to prevent such swinging or movement, which could reduce the clearance to less than that specified in item (6) above? (h)(7)		
Prohibition. (h)(8)		
Where fixed electrostatic apparatus is used, is material manipulation prohibited by hand? (h)(8)		
Fail-Safe Controls. (h)(9)		
Is the electrostatic apparatus equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer and, to signal the operator under any of the following conditions:		
(i) Stoppage of ventilating fans or failure of ventilating equipment from any cause?		
(ii) Stoppage of the conveyor carrying goods through the high voltage field?		
(iii) Occurrence of a ground or of an imminent ground at any point on the high voltage system?		
(iv) Reduction of clearance below that specified in item (6) of this checklist, above? (h)(9)		
Guarding. (h)(10)		
Is fixed electrostatic apparatus equipment guarded by adequate booths, fencing, or railings to insure that a safe isolation of the process is maintained from plant or storage or personnel? (h)(10)		

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS
(h) Fixed Electrostatic Apparatus.

	YES	NO
Are such railings, fencing, and guards of a conducting material and are they adequately grounded? (h)(10)		
Ventilation. (h)(11)		
Where electrostatic atomization is used, is the spraying area so ventilated as to insure safe conditions from a fire and health standpoint? (h)(11)		
Fire Protection. (h)(12)		
Are all areas used for spraying, including the interior of the booth, protected by automatic sprinklers where this protection is available? (h)(12)		
In the event this protection is not available, is other approved automatic extinguishing equipment provided? (h)(12)		
(i) Electrostatic Hand Spraying Equipment.		
Conformance. (i)(2)		
Does the electrostatic hand spraying equipment conform with the other provisions of this checklist in this section? (i)(2)		
Equipment Approval and Specifications. (i)(3)		
Is the electrostatic hand spray apparatus and devices used in connection with coating operations of the approved type? (i)(3)		
Are the high-voltage circuits so designed as to not produce a spark of sufficient intensity to ignite any vapor-air mixtures, nor result in appreciable shock hazard upon coming in contact with a grounded object under all normal operating conditions? (i)(3)		
Are the electrostatically charged exposed elements of the handgun capable of being energized only by a switch which also controls the coating material supply? (i)(3)		
Electrical Support Equipment. (i)(4)		
Do transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, with the exception of the handgun itself, conform to the requirements of items in paragraph (c) of this section, and are they located outside of the spraying area? (i)(4)		
Spray Gun Ground. (i)(5)		
Is the handle of the spraying gun electrically connected to the ground by a metallic connection? (i)(5)		
Is the handle of the spraying gun so constructed that the operator in normal operating position is in intimate electrical contact with the grounded handle? (i)(5)		
Grounding – General. (i)(6)		
Are all electrically conducted objects in the spraying area adequately grounded? (i)(6)		
Does this equipment carry a prominent permanently installed warning regarding the necessity for this grounding feature? (i)(6)		

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS
(i) Electrostatic Hand Spraying Equipment.

YES NO

Maintenance of Grounds. (i)(7)

Are objects being painted or coated maintained in metallic contact with the conveyor or other grounded support? (i)(7)

Are hooks that may be used regularly cleaned to insure this contact, and are areas of contact of sharp points or knife edges where possible? (i)(7)

Are points of support of the object concealed from random spray where feasible and where the objects being sprayed are supported from a conveyor? (i)(7)

Is the point of attachment to the conveyor so located as to not collect spray material during normal operation? (i)(7)

Interlocks. (i)(8)

Is the electrical equipment so interlocked with the ventilation of the spraying area that the equipment cannot be operated unless the ventilation fans are in operation? (i)(8)

Ventilation. (i)(9)

Does the spraying operation take place within a spray area which is adequately ventilated to remove solvent vapors released from the operation? (i)(9)

(j) Drying, Curing, or Fusion Apparatus.

Conformance. (j)(1)

Does the drying, curing, or fusion apparatus in connection with spray application of flammable or combustible finishes conform to the Standard for Ovens and Furnaces, NFPA 86A-1969, and do they conform with the following items of this checksheet? (j)(1)

Alternate Use Prohibited. (j)(2)

Is the use of spray booths, rooms, or other enclosures used for spraying operations prohibited for the purpose of drying by any arrangement which would cause a material increase in the surface temperature of the spray booth, room, or enclosure? (j)(2)

Adjacent System Interlocked. (j)(3)

Are drying, curing, or fusion units utilizing a heating system having open flames or which may produce sparks, prohibited from being installed in a spraying area? (j)(3)

Exception: See items in (4) below for specific exceptions.

If drying, curing, or fusion units, utilizing a heating system having open flames, are installed adjacent to spray booths, are they equipped with an interlocked ventilating system arranged to:

(i) Thoroughly ventilate the drying space before the heating system can be started?
(ii) Maintain a safe atmosphere at any source of ignition?
(iii) Automatically shut down the heating system in the event of failure of the ventilating system? (j)(3)(i)

Alternate Use Permitted. (j)(4)

Automobile refinishing spray booths or enclosures, otherwise installed and maintained in full conformity with this section, may alternately be used for drying with portable electrical infrared drying apparatus, when the following items can be answered in the affirmative: (j)(4)

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS
(j) Drying, Curing, or Fusion Apparatus.

YES NO

(i) Is the interior (especially floors) of spray enclosures kept free of overspray deposits?
(ii) During spray operations, is the drying apparatus and electrical connections and wiring thereto prohibited from being located within the spray enclosure, or any other location where spray residues may be deposited thereon?
(iii) Is the spraying apparatus, the drying apparatus, and the ventilating system of the spray enclosure equipped with suitable interlocks that are arranged in compliance with *(a), (b),* and *(c)* below:

> *(a)* Is the spraying apparatus equipped with interlocks so that it cannot be operated while the drying apparatus is inside the spray enclosure?
> *(b)* Is the spray enclosure purged of spray vapors for a period of not less than 3 minutes before the drying apparatus can be energized?
> *(c)* Is the ventilating system that will maintain a safe atmosphere within the enclosure during the drying process and the drying apparatus, automatically shut off in the event of failure of the ventilating system?

(iv) Does all electrical wiring and equipment of the drying apparatus conform with the applicable sections of subpart S of this part?
Is only electrical wiring and equipment of a type approved for Class I, Division 2 hazardous locations located within 18 inches of floor level?
Are all metallic parts of the drying apparatus properly electrically bonded and grounded?
(v) Does the drying apparatus contain a prominently located, permanently attached warning sign indicating that ventilation should be maintained during the drying period and that spraying should not be conducted in the vicinity that spray will deposit on apparatus? (j)(4)

(k) Automobile Undercoating in Garages.

Automobile undercoating spray operations in garages, conducted in areas having adequate ventilation, are exempt from the requirements pertaining to spray finishing operations, when using undercoating materials not more hazardous than kerosene or undercoating materials using only solvents listed as having a flash point in excess of 100°F. (k)

Undercoating spray operations not provided for above are subject to all requirements of the items of this checklist pertaining to spray finishing operations. (k)

(l) Powder Coating.

Electrical and Other Sources of Ignition. (l)(1)

Does electrical equipment and other sources of ignition conform to the requirements of paragraphs 1910.107(c)(8) and (9)(i) of this section, and those items which are reproduced for your convenience at this time:

1910.107(c)(8): Are portable electric lamps prohibited from being used in any spraying area during spraying operations? (l)(1)

Are portable electric lamps, if used during cleaning or repairing operations, of the type approved for hazardous Class I locations? (l)(1)

1910.107(c)(9)(i): Are all metal parts of spray booths, exhaust ducts, and piping systems conveying flammable or combustible liquids or aerated solids properly electrically grounded in an effective and permanent manner? (l)(1)

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS
(l) Powder Coating.

YES NO

Ventilation. (l)(2)

In addition to the items of paragraph (d) of this section, where they apply, does the exhaust ventilation sufficiently maintain the atmosphere below the lowest explosive limits for the materials being applied? (l)(2)(i)

Are all non-deposited air-suspended powders safely removed via exhaust ducts to the powder recovery cyclone or receptacle? (l)(2)(i)

Is each installation so designed and operated to meet the foregoing performance specification? (l)(2)(i)

Are precautions taken to insure that powders will not be released to the outside atmosphere? (l)(2)(ii)

Drying, Curing, or Fusion Equipment. (l)(3)

Are the applicable provisions of the Standard for Ovens and Furnaces, NFPA No. 86A-1969 complied with? (l)(3)

Operation and Maintenance. (l)(4)

Are all areas kept free of the accumulation of powder coating dusts, which areas include horizontal surfaces, such as ledges, beams, pipes, hoods, booths, and floors? (l)(4)(i)

Are surfaces cleaned in such a manner as to avoid scattering dust to other places or creating dust clouds? (l)(4)(ii)

Are "No Smoking" signs in large letters or contrasting color background conspicuously posted at all powder coating areas and powder storage rooms? (l)(4)(iii)

Fixed Electrostatic Spraying Equipment. (l)(5)

Are the items listed in 1910.107(h) in this checklist, as well as other subparagraphs of this paragraph used in connection with fixed electrostatic equipment? (l)(5)

Electrostatic Hand Spraying Equipment. (l)(6)

Are the items listed in 1910.107(i) in this checklist, as well as other subparagraphs of this paragraph, used to determine that electrostatic handgun use is done safely? (l)(6)

Electrostatic Fluidized Beds. (l)(7)

Are electrostatic fluidized beds and associated equipment of the approved types? (l)(7)(i)

Is the maximum surface temperature of this equipment in the coating area limited to 150°F.? (l)(7)(i)

Are the high voltage circuits so designed so as not to produce a spark of sufficient intensity to ignite any powder-air mixtures nor result in appreciable shock hazard upon coming in contact with a grounded object under normal operating conditions? (l)(7)(i)

Are all transformers, powerpacks, control apparatus, and all other electrical portions of the equipment, except the charging electrodes and their connections to the power supply, located outside of the powder coating area? (l)(7)(ii)

Are all electrically conductive objects within the charging influence of the electrodes adequately grounded? (l)(7)(iii)

Does the powder coating equipment carry a prominent, permanently installed warning regarding the necessity for grounding these objects? (l)(7)(iii)

Are objects being coated maintained in contact with the conveyor or other support in order to insure proper grounding? (l)(7)(iv)

1910.107 – SPRAY FINISHING USING FLAMMABLE AND COMBUSTIBLE MATERIALS
(l) Powder Coating.

YES NO

Are hangers regularly cleaned to insure effective contact, and are such areas of contact sharp points or knife edges where possible? (l)(7)(iv)

Is the electrical equipment so interlocked with the ventilation system that the equipment cannot be operated unless the ventilation fans are in operation? (l)(7)(v)

(m) Organic Peroxides and Dual Component Coatings.

Conformance. (m)(1)

Are all spraying operations involving the use of organic peroxides and other dual component coatings conducted in approved sprinklered spray booths meeting the requirements of the items in this section? (m)(1)

Smoking. (m)(2)

Is smoking prohibited and "No Smoking" signs prominently displayed in areas where spraying operations involving the use of organic peroxides and other dual components are being conducted? (m)(2)

Are only nonsparking tools used in any area where organic peroxides are stored, mixed or applied? (m)(2)

1910.108 – DIP TANKS CONTAINING FLAMMABLE OR COMBUSTIBLE LIQUIDS

(a) Definitions applicable to this section:

Dip tank, shall mean a tank, vat, or container in which articles or materials are immersed for the purpose of coating, finishing, treating or similar processes. (a)(1)

Vapor area, shall mean any area containing dangerous quantities of flammable vapors in the vicinity of dip tanks, their drainboards, or associated equipment during operation or shutdown periods. (a)(2)

(b) Ventilation.

Vapor Area Ventilation. (b)(1)

Are vapor areas as defined in paragraph 1910.108(a)(2) limited to the smallest practical space by maintaining a properly designed system of mechanical ventilation arranged to move air from all directions towards the vapor area origin, and thence to a safe outside location? (b)(1)

Do ventilating systems conform to the Standards for Blower and Exhaust Systems, NFPA Pamphlet No. 91-1969? (b)(1)

Are the required ventilating systems so arranged that the failure of any ventilating fan will automatically stop any dipping conveyor system? (b)(1)

Ventilation Combined With Drying. (b)(2)

Are means provided to pre-ventilate spaces which are used for drying operations that utilize a heating system which may be an ignition source? (b)(2)

Are these pre-ventilation means required to be in operation before the heating system can be started? (b)(2)

Are means provided whereby the failure of any ventilating fan will automatically shut down the heating system? (b)(2)

Does the installation otherwise conform to the Standard for Ovens and Furnaces, NFPA No. 86A-1969? (b)(2)

1910.108 – DIP TANKS CONTAINING FLAMMABLE OR COMBUSTIBLE LIQUIDS

YES NO

(c) Construction of Dip Tanks.

General. (c)(1)

Are dip tanks, including drainboards if provided, constructed of substantial noncombustible material? (c)(1)

Are the dip tank supports constructed of heavy metal, reinforced concrete, or masonry? (c)(1)

Overflow Pipes. (c)(2)

Do dip tanks of over 150 gallons in capacity or 10 square feet in liquid surface area have a properly trapped overflow pipe leading to a safe location outside of buildings? (c)(2)(i)

Are overflow pipes of sufficient capacity to overflow the maximum delivery of dip tank liquid fill pipes, but not less than 3 inches in diameter? (c)(2)(ii)

Are piping connections on drains and overflow lines so designed as to permit ready access for inspection and cleaning of the interior? (c)(2)(iii)

Is the bottom of the overflow connection at least 6 inches below the top of the tank? (c)(2)(iv)

Bottom Drains. (c)(3)

Are dip tanks over 500 gallons in liquid capacity equipped with bottom drains, automatically and manually arranged to quickly drain the tank in the event of fire? (c)(3)(i)

Exception: Unless the viscosity of the liquid at normal atmospheric temperatures makes this impractical.

Are means taken to insure that manual operation will be done from a safely accessible location? (c)(3)(i)

Where gravity flow is not practicable, are automatic pumps required? (c)(3)(i)

Are bottom drains trapped? (c)(3)(ii)

Are bottom drains discharged to a closed properly vented salvage tank, or to a safe location outside which will not endanger property? (c)(3)(ii)

Are the diameters of bottom drainpipes as required by the following: (c)(3)(iii)

500 to 750 gallon capacity	3 Inches
750 to 1,000 gallon capacity	4 Inches
1,000 to 2,500 gallon capacity	5 Inches
2,500 to 4,000 gallon capacity	6 Inches
Over 4,000 gallon capacity	8 Inches

Salvage Tanks. (c)(4)

Is the capacity of the salvage tank greater than the capacity of the dip tank or tanks to which they are connected? (c)(4)

Automatic Extinguishing Facilities. (c)(5)

Are all dip tanks exceeding 150 gallons liquid capacity, or having a liquid surface area exceeding 4 square feet, protected with at least one of the automatic extinguishing facilities, as listed in items under 1910.108(g)(2), (3), (4), (5), or (6) which follow in normal sequence in this checklist? (c)(5)

1910.108 – DIP TANKS CONTAINING FLAMMABLE OR COMBUSTIBLE LIQUIDS
(c) Construction of Dip Tanks.

YES NO

NOTE: The above item **does not** apply to hardening and tempering tanks having a liquid surface area less than 25 square feet, or a liquid capacity of 500 gallons or less.

Conveyor Systems. (c)(6)

Are dip tanks that utilize a conveyor system so arranged that in the event of fire, the conveyor system will automatically cease motion and the required bottom drains will open? (c)(6)

Are such conveyor systems automatically provided with means that will stop them if the required ventilation is not in full operation? (c)(6)

Heating Dip Tank Liquids. (c)(7)

When dip tank liquids are artificially heated, are provisions made to prevent a temperature rise greater than 50°F. below the flashpoint of the liquid? (c)(7)

(d) Liquids Used in Dip Tanks, Storage and Handling.

Does the storage of flammable and combustible liquids in connection with dipping operations conform to the requirements of this checklist, contained in 1910.106, where applicable? (d)

Where portable containers are used for the replenishment of flammable and combustible liquids, are provisions made so that both the container and the tank are positively grounded and electrically bonded to prevent static electric sparks? (d)

(e) Electrical and Other Sources of Ignition.

Vapor Areas. (e)(1)

Are precautions taken to insure that there are no open flames, spark producing devices, or heated surfaces having a temperature sufficient to ignite vapors in any vapor area? (e)(1)(i)

Is the electrical wiring and equipment in any vapor area, as defined in 1910.108(a)(2) of the explosion-proof type according to the requirements of subpart S of this part for Class I, Group D locations, and do they otherwise conform to subpart S? (e)(1)(i)

NOTE: The above item concerning electrical wiring and equipment **does not** apply to electrostatic apparatus, which is specifically permitted in paragraph 1910.108(h)(3) of the items in the checklist, which follow in normal sequence.

Are provisions made to insure that there are no unapproved electrical equipments in the vicinity of dip tanks or associated drainboards or drying operations that are subject to splashing or dripping of the liquids? (e)(1)(ii)

Exception: Wiring in rigid conduit or in threaded boxes or fittings containing no taps, splices, or terminal connections are permitted.

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1910.108 – DIP TANKS CONTAINING FLAMMABLE OR COMBUSTIBLE LIQUIDS

(e) Electrical and Other Sources of Ignition.

		YES	NO
Adjacent Areas.	(e)(2)		
Are open flames or spark producing devices, except as specifically permitted in NFPA Standard No. 86A, prohibited in any floor space outside a vapor area but within 20 feet therefrom, that are not separated by tight partitions?	(e)(2)		
Is the electrical wiring and equipment installed outside of the vapor area, but within 20 feet therefrom, in accordance with the provisions of subpart S of this part?	(e)(2)		
(f) Operations and Maintenance.			
General.	(f)(1)		
Are areas in the vicinity of dip tanks kept as clear of combustible stock as practical?	(f)(1)		
Are areas in the vicinity of dip tanks kept entirely free of combustible debris?	(f)(1)		
Waste Cans.	(f)(2)		
Are approved metal waste cans provided where waste or rags are used in connection with dipping operations?	(f)(2)		
Are all impregnated rags or waste deposited in the approved metal waste cans immediately after use?	(f)(2)		
Are the contents of waste cans properly disposed of at least once daily at the end of each shift?	(f)(2)		
Inspection.	(f)(3)		
Are periodic inspections or tests of all dip tank facilities made?	(f)(3)		
Do these periodic tests or inspections include covers, overflow pipe inlets and discharge, bottom drains and valves, electrical wiring and equipment and grounding connections, ventilating facilities, and all extinguishing equipment?	(f)(3)		
If any defects are found, are they promptly corrected?	(f)(3)		
Warning Signs.	(f)(4)		
Are "No Smoking" signs provided and are the letters large on a contrasting color background and are they conspicuously posted in the vicinity of the dip tanks?	(f)(4)		
(g) Extinguishment.			
Extinguishers.	(g)(1)		
Are areas in the vicinity of dip tanks provided with manual fire extinguishers suitable for flammable and combustible liquid fires, conforming to 1910.157?	(g)(1)		
Automatic Water Spray Extinguishing Systems.	(g)(2)		
Do automatic water spray extinguishing systems conform to 1910.163?	(g)(2)		
Are the systems arranged to protect tanks, drainboards, and stock over drainboards?	(g)(2)		
Automatic Foam Extinguishing Systems.	(g)(3)		
Do automatic foam extinguishing systems conform to 1910.163?	(g)(3)		
Automatic Carbon Dioxide Systems.	(g)(4)		
Do automatic carbon dioxide systems conform to 1910.162?	(g)(4)		
Are the systems arranged to protect both dip tanks and drainboards?	(g)(4)		

1910.108 – DIP TANKS CONTAINING FLAMMABLE OR COMBUSTIBLE LIQUIDS

(g) Extinguishment.

		YES	NO
Unless stock over drainboards is otherwise protected with automatic extinguishing facilities, are systems arranged to protect such stock?	(g)(4)		
Dry Chemical Extinguishing Systems.	(g)(5)		
Do dry chemical extinguishing systems conform to 1910.161?	(g)(5)		
Are systems arranged to protect both dip tanks and drainboards?	(g)(5)		
Unless stock over drainboards is otherwise protected with automatic extinguishing facilities, are systems arranged to protect such stock?	(g)(5)		
Dip Tank Covers.	(g)(6)		
Are covers arranged to close automatically in the event of fire, and are they actuated by approved automatic devices, and can they also be manually operated?	(g)(6)(i)		
Are covers of substantial noncombustible material or of tin-clad type with enclosing metal applied with locked joints?	(g)(6)(ii)		
Where the burning of a cord would interfere with the action of a device, are chains or wire rope used for cover support or operating mechanism?	(g)(6)(iii)		
Are procedures established whereby covers will be kept closed when tanks are not in use?	(g)(6)(iv)		
(h) Special Dip Tank Applications.			
Hardening and Tempering Tanks.	(h)(1)		
Are such tanks located as far as practicable from furnaces?	(h)(1)(i)		
Are such tanks prohibited from being located on or near combustible floors?	(h)(1)(i)		
Are such tanks provided with a noncombustible hood and vent or other equally effective means of venting to the outside of the building?	(h)(1)(ii)		
Are all such vent ducts treated as flues and kept well away from combustible roofs or materials?	(h)(1)(ii)		
Are tanks so designed that the maximum workload is incapable of raising the temperature of the cooling medium to within 50° below its flashpoint?	(h)(1)(iii)		
Or as an alternate to the item immediately above, are such tanks equipped with circulating cooling systems which will accomplish the same result?	(h)(1)(iii)		
Are tanks equipped with a high temperature limit switch arranged to sound an alarm when the temperature of the quenching medium reaches within 50° below the flashpoint?	(h)(1)(iv)		

1910.108 – DIP TANKS CONTAINING FLAMMABLE OR COMBUSTIBLE LIQUIDS
(h) Special Dip Tank Applications.

	YES	NO
Are such limit switches so connected that they will shut down conveying equipment supplying work to the tank, if the shutting down is practical from an operating standpoint? **(h)(1)(iv)**		
Are hardening and tempering tanks having a liquid surface area of 25 square feet or more, or a capacity of 500 gallons or more, provided with at least one of the automatic extinguishing facilities conforming to the items in (g)(2), (3), (4), (5) or (6)? **(h)(1)(v)**		
Is the use of air under pressure prohibited to fill or to agitate oil tanks? **(h)(1)(vi)**		
Where drain facilities from the bottom of the tank are combined with the oil circulating system, or arranged independently to drain the oil to a safe location, is the drain valve operated automatically with approved heat actuated devices or manually where the valve is at a safe distance? **(h)(1)(vii)**		
Flow Coat – General. **(h)(2)**		
Do all flow coat operations comply with the preceding items for dip tanks? **(h)(2)(i)**		
Is all piping strongly erected and rigidly supported? **(h)(2)(ii)**		
Is paint supplied by direct low-pressure pumping, so arranged to automatically shut down by means of approved heat actuated devices in the case of fire? **(h)(2)(iii)**		
Or as an alternative, is paint supplied by a gravity tank not exceeding 10 gallons in capacity? **(h)(2)(iii)**		
Is the area of the sump and any areas on which paint flows considered to be a dip tank? **(h)(2)(iv)**		
Electrostatic Apparatus – General. **(h)(3)**		
Does the installation and use of electrostatic detearing equipment conform to the items in 1910.108(b) through (g)? **(h)(3)(i)**		
Are electrostatic apparatus and devices used in connection with paint detearing operations of the approved type? **(h)(3)(ii)**		
With the exception of high voltage grids and their connections, are transformers, powerpacks, control apparatus, and all other electrical portions of the equipment located outside the vapor area, or do they conform to the requirements in the checklist under 1910.108(e)? **(h)(3)(iii)**		
Are electrodes of substantial construction? **(h)(3)(iv)**		
Are electrodes rigidly supported in permanent locations? **(h)(3)(iv)**		
Are electrodes effectively insulated from ground? **(h)(3)(iv)**		
Are insulators constructed of nonporous and noncombustible material? **(h)(3)(iv)**		
Are high voltage leads to electrodes effectively and permanently supported on suitable insulators? **(h)(3)(v)**		
Are high voltage leads to electrodes effectively guarded against accidental contact or grounding? **(h)(3)(v)**		
Is there an automatic means provided for grounding and discharging any accumulated residual charge on the electrode assembly or the secondary circuit of the high voltage transformer when the transformer primary is disconnected from the source of supply? **(h)(3)(v)**		

1910.108 – DIP TANKS CONTAINING FLAMMABLE OR COMBUSTIBLE LIQUIDS
(h) Special Dip Tank Applications.

	YES	NO
Is there a space equal to twice the sparking distance between goods being deteared and electrodes or conductors maintained? **(h)(3)(vi)**		
Is there a suitable sign stating the sparking distance conspicuously posted near the assembly? **(h)(3)(vi)**		
Are goods that are being deteared using this electrostatic process supported on conveyors? **(h)(3)(vii)**		
Are the conveyors so arranged as to maintain safe distances between the goods and the electrodes at all times? **(h)(3)(vii)**		
Are all goods so supported as to prevent any swinging or movement which would reduce the clearance to less than twice the sparking distance? **(h)(3)(vii)**		
Is the use of electrostatic processes prohibited where goods are being deteared and are manipulated by hand? **(h)(3)(viii)**		
Is all electrostatic apparatus equipped with automatic controls which will operate without time delay to disconnect the power supply to the high voltage transformer? **(h)(3)(ix)**		
Do these automatic controls signal the operator under any of the following conditions: *(a)* Stoppage of ventilating fans or failure of ventilating equipment from any cause? *(b)* Stoppage of the conveyor carrying goods past the high voltage grid? *(c)* Occurrence of a ground or of an imminent ground at any point on the high voltage system? *(d)* Reduction of clearance below twice the sparking distance? **(h)(3)(ix)**		
Is adequate fencing, railings, or guards placed about the equipment? **(h)(3)(x)**		
Do these guarding means assure that a safe isolation of the process is maintained from plant storage or personnel? **(h)(3)(x)**		
Are such railings, fencing and guards of conducting material adequately grounded? **(h)(3)(x)**		
Are precautions taken to insure that electrode insulators are kept clean and dry? **(h)(3)(xi)**		
Is the electrostatic detearing ventilated by exhausting adequate air from the area, as required by the items in 1910.108(b) of this checklist? **(h)(3)(xii)**		
Are all areas for detearing protected by automatic sprinklers? **(h)(3)(xiii)**		
Where automatic sprinklers are not provided, is other approved automatic extinguishing equipment provided? **(h)(3)(xiii)**		
Are drip plates and screens subject to paint deposits removable, and are they taken to a safe place for cleaning? **(h)(3)(xiv)**		
Roll Coating. **(h)(4)**		
Are the items contained in this checklist under 1910.108(b) through (g) used for the processes of roll coating, spreading and impregnating? **(h)(4)(i)**		
In addition to the above items, are the following items complied with:		

YES NO

Are all metallic rotating and other parts of machinery and equipment electrically bonded and grounded? (h)(4)(ii)

Are static collectors installed or other methods used for maintaining a conductive atmosphere, such as a high relative humidity? (h)(4)(ii)

1910.109 – EXPLOSIVES AND BLASTING AGENTS

(a) Definitions Applicable to This Section.

This section applies to the manufacture, keeping, having, storage, sale, transportation, and use of explosives, blasting agents, and pyrotechnics. This section **does not** apply to the sale and use (public display) of pyrotechnics, commonly known as fireworks, nor to the use of explosives in the form prescribed by the official U.S. Pharmacopeia. (a)

(b) Miscellaneous Provisions.

General Hazard. (b)(1)

Are precautions taken to insure that the storage, handling, or transporting of explosives are such that they will not constitute an undue hazard to life? (b)(1)

(c) Storage of Explosives.

The provisions of paragraph (c) **do not** apply to:

(a) Stocks of small arms ammunition, propellant-actuated power cartridges, small arms ammunition primers in quantities of less than 750,000, or of smokeless propellants in quantities less than 750 pounds;
(b) Explosive-actuated power devices when in quantities less than 50 pounds net weight of explosives;
(c) Fuse lighters and fuse ignitors;
(d) Safety fuses other than cordeau detonant fuses. (c)

General Provisions. (c)(1)

Are all Class A, Class B, Class C explosives and any special industrial explosives kept in magazines which meet the requirements of this paragraph and checklist? (c)(1)(i)

Are precautions taken to insure that blasting caps, electric blasting caps, detonating primers, and primed cartridges are not stored in the same magazine with other explosives? (c)(1)(ii)

Does the ground around magazines slope away for drainage purposes? (c)(1)(iii)

Is the land surrounding magazines kept clear of brush, dried grass, leaves, and other materials for a distance of at least 25 feet? (c)(1)(iii)

Where the quantity of explosives stored is more than 50 pounds, are Class I magazines provided? (c)(1)(v)

Where the quantity of explosives stored is 50 pounds or less, are Class II magazines provided? (c)(1)(v)

Is Table H-21 (see Appendix) used for the proper storage of explosives? (c)(1)(vi)

Are Class II magazines located in conformity with Table H-21? (See Appendix.) (c)(1)(vii)

Are Class II magazines located away from other magazines where the temporary storage is at a building site, or a site for blasting operations? (c)(1)(viii)

YES NO

Is there a distance of at least 150 feet between Class II magazines and the work in progress, when the quantity of explosives kept therein is in excess of 25 pounds? (c)(1)(viii)

Is the distance at least 50 feet when the quantity of explosives is 25 pounds or less? (c)(1)(viii)

Construction of Magazines – General. (c)(2)

Are magazines constructed in conformity with the following items in this checklist? (c)(2)(i)

Are magazines for the storage of explosives, other than black powder, and Class B and Class C explosives, bullet resistant, weather resistant, and fire resistant? (c)(2)(ii)

Are such magazines ventilated sufficiently to protect the explosive in the specific locality? (c)(2)(ii)

Are magazines used for storage of black powder, Class B and Class C explosives, weather resistant and fire-resistant, and do they have ventilation? (c)(2)(ii)

Are magazines for storage of blasting and electric blasting caps weather resistant, fire-resistant, and ventilated? (c)(2)(ii)

Is the property upon which Class I magazines are located posted with signs reading "Explosives – Keep Off"? (c)(2)(iii)

Is the property where Class II magazines are located outside of buildings posted with signs reading "Explosives – Keep Off"? (c)(2)(iii)

Are magazines requiring heat heated by either hot-water radiant heating with the magazine building? or, (c)(2)(iii)

Air directed into the magazine building over either hot water or low pressure steam coils located outside the magazine building? (c)(2)(iv)

Does the magazine heating system meet the following requirements:

(a) Are the radiant heating coils within the building installed in such a manner that the explosives or explosives containers cannot contact the coils?
Is the air free to circulate between the coils and the explosives or explosive containers?
(b) Are heating ducts installed in such a manner that the hot-air discharge from the duct is not directed against the explosives or explosives containers?
(c) Is the heating device used in connection with a magazine provided with controls which prevent the ambient building temperature from exceeding 130°F.?
(d) Is the electric fan or pump used in the heating system for a magazine mounted outside, and is it separate from the wall of the magazine?
Is such fan or pump grounded?
(e) Are the electric fan motors and the controls for electrical heating devices used in heating water or steam provided with overloads and disconnects, which comply with subpart S?
Is all electrical switch gear located a minimum distance of 25 feet from the magazine?

	YES	NO
(f) Is the heating source for water or steam separated from the magazine by a distance of not less than 25 feet when it is electrical, and not less than 50 feet when fuel fired? Is the area between the heating unit and the magazine cleared of all combustible materials? *(g)* Are explosives and explosive containers so stored in the magazine that allows uniform air circulation so product temperature uniformity can be maintained? (c)(2)(v)		
When lights are necessary inside the magazine, are electric safety flashlights, or electric safety lanterns provided and used? (c)(2)(vi)		
Construction of Class I Magazines. (c)(3)		
Are Class I magazines constructed of masonry, wood, or metal construction, or a combination of these types? (c)(3)(i)		
Is the thickness of masonry units at least 8 inches? (c)(3)(i)		
When hollow masonry units are used in construction in a magazine, are they required to be bullet resistant and have all hollow spaces filled with weak cement or well-tamped sand? (c)(3)(i)		
Are wood constructed magazines that are required to be bullet resistant, have at least a 6-inch space between interior and exterior sheathing, and is this space filled with well-tamped sand? (c)(3)(i)		
For metal wall construction, when a magazine is required to be bullet resistant, are the walls lined with brick at least 4 inches thick, or are the walls provided with a 6-inch sandfill between interior and exterior walls? (c)(3)(i)		
If wood floors are used, are they tongue and grooved lumber having a nominal thickness of 1 inch? (c)(3)(ii)		
On roofs that are required to be bullet resistant, are they protected by a sand tray located at the line of the eaves and covering the entire area except that necessary for ventilation? (c)(3)(iii)		
Is the sand in the sand tray maintained at a depth of not less than 4 inches? (c)(3)(iii)		
Is all wood at the exterior of magazines, including the eaves, protected by being covered with black or galvanized steel or aluminum metal of thickness of not less than 26 gage? (c)(3)(iv)		
Are all nails exposed to the interior of the magazines well countersunk? (c)(3)(iv)		
Are foundations for magazines of substantial construction and arranged to provide good cross-ventilation? (c)(3)(v)		
Are magazines ventilated sufficiently to prevent dampness and heating of stored explosives? (c)(3)(vi)		
Are the ventilating openings provided with screens to prevent the entrance of sparks? (c)(3)(vi)		
Are the openings to magazines restricted to that necessary for the placement and removal of stocks of explosives? (c)(3)(vii)		
Are doors for openings in magazines for Class A explosives bullet resistant? (c)(3)(vii)		
Are doors for magazines not required to be bullet resistant, so designed to prevent unauthorized entrance to the magazine? (c)(3)(vii)		

	YES	NO
Are provisions made to prevent the piling of stocks of explosives directly against masonry walls, brick-lined or sand-filled metal walls and single-thickness metal walls? (c)(3)(ix) NOTE: Storage in the above manner cannot interfere with proper ventilation at the interior of side and end walls.		
Construction of Class II Magazines. (c)(4)		
Are Class II magazines constructed of at least metal or wood, or a combination thereof? (c)(4)(i)		
Do wood magazines for Class II have sides, bottom, and cover constructed of 2-inch hardwood boards well braced at the corners? (c)(4)(ii)		
Are such boards protected by being entirely covered with sheet metal of not less than No. 20 gage? (c)(4)(ii)		
Are all nails exposed to the interior of the magazine well countersunk? (c)(4)(ii)		
Are magazines of metal construction for this class lined with a 3/8 inch plywood or equivalent lining on the sides, bottom and cover under the sheet metal? (c)(4)(ii)		
Do the edges of metal covers overlap the sides by at least 1 inch? (c)(4)(ii)		
Are substantial strap hinges provided for the covers of both wood and metal- constructed magazines? (c)(4)(iii)		
Are these magazines provided with a substantial means for locking? (c)(4)(iii)		
Are magazines of this class painted red? (c)(4)(iv)		
Do magazines of this class bear lettering in white, on all sides and top, at least 3 inches high, "Explosives – Keep Fire Away"? (c)(4)(iv)		
Are Class II magazines when located in warehouses, and in wholesale and retail establishments provided with substantial wheels or casters to facilitate easy removal in the case of fire? (c)(4)(iv)		
Are Class II magazines ventilated where necessary due to climatic conditions? (c)(4)(iv)		
Storage Within Magazines. (c)(5)		
Are packages of explosives laid flat with top side up? (c)(5)(i)		
When black powder is stored in magazines with other explosives, is it stored separately? (c)(5)(i)		
When black powder is stored in kegs, are the kegs stored on ends with the bungs down, or on the side, with the seams down? (c)(5)(i)		
When corresponding grades and brands are stored together, are they so stored that the brands and grade marks show? (c)(5)(i)		
Are all stocks stored so as to be easily counted and checked? (c)(5)(i)		

	YES	NO
Are all packages of explosives piled in a stable manner? (c)(5)(i)		
When any kind of explosive is removed from a magazine for use, is the oldest explosive of that particular kind taken first? (c)(5)(i)		
Are provisions made to insure that packages of explosives will not be unpacked or repacked in a magazine nor within 50 feet of a magazine or in close proximity to other explosives? (c)(5)(ii)		
Are tools used for opening packages of explosives constructed of nonsparking materials? (c)(5)(ii) **Exception:** Metal slitters may be used for opening fiberboard boxes.		
Is a wood wedge and a fiber, rubber, or wood mallet used for opening or closing wood packages or explosives? (c)(5)(ii)		
Are opened packages of explosives securely closed before being returned to the magazine? (c)(5)(ii)		
Are precautions taken to insure that magazines will not be used for the storage of any metal tools, nor any commodity except explosives? (c)(5)(iii) NOTE: This restriction **does not** apply to the storage of blasting agents and blasting supplies.		
Are procedures established whereby magazine floors will be regularly swept, kept clean, dry, free of grit, paper, empty used packages, and rubbish? (c)(5)(iv)		
Are brooms and other cleaning utensils prohibited from having any spark-producing metal parts? (c)(5)(iv)		
Are sweepings from floors of magazines properly disposed of? (c)(5)(iv)		
Are magazine floors that are stained with nitroglycerin cleaned in accordance with the instructions of the manufacturer? (c)(5)(iv)		
Are all explosives that have deteriorated to an extent that they are in an unstable or dangerous condition, destroyed in accordance with the instructions of the manufacturer? (c)(5)(v)		
Are all explosives that have leaked nitroglycerin destroyed immediately, in accordance with the instructions of the manufacturer? (c)(5)(v)		
Are only persons that are experienced allowed to do this work of destroying the explosives? (c)(5)(v)		
Are all explosives removed from magazines that are having inside repairs? (c)(5)(vi)		
Are the floors cleaned before repairing the magazines? (c)(5)(vi)		
When making outside repairs, where there is a possibility of causing sparks or fire, are the explosives removed from the magazine? (c)(5)(vi)		
Are all explosives that are removed from a magazine under repair placed in another magazine, or placed a safe distance from the magazine where they are properly guarded and protected? (c)(5)(vi)		
Are all explosives that have been removed returned immediately to the magazine upon completion of the repairs? (c)(5)(vi)		

	YES	NO
Are all smoking, matches, open flames, spark-producing devices, and firearms prohibited inside of or within 50 feet of the magazines? (c)(5)(vii) **Exception:** Firearms carried by guards.		
Is the land surrounding a magazine kept clear of all combustible materials for a distance of at least 25 feet? (c)(5)(vii)		
Is the storage of combustible materials prohibited within 50 feet of magazines? (c)(5)(vii)		
Are all magazines in the charge of a competent person? (c)(5)(viii)		
Does this person understand that he is responsible for the enforcement of all safety precautions? (c)(5)(viii)		
Are all explosives recovered from blasting misfires placed in a separate magazine until competent personnel have determined from the manufacturer the method of disposal? (c)(5)(ix)		
Is the use of caps recovered from blasting misfires prohibited? (c)(5)(ix)		
Are all such explosives and caps disposed of in the manner recommended by the manufacturer? (c)(5)(ix)		
(d) Transportation of Explosives. *General Provisions.* (d)(1)		
Are all employees prohibited from smoking, carrying matches or any other flame-producing device while in or near a motor vehicle transporting explosives? (d)(1)(i)		
Are employees prohibited from carrying any firearms or loaded cartridges while in or near a motor vehicle transporting explosives? (d)(1)(i)		
Are precautions taken to insure that employees driving, loading or unloading a vehicle transporting explosives will not do so in a careless or reckless manner? (d)(1)(i)		
Are explosives prohibited from being transferred from one vehicle to another, within any jurisdiction, without first notifying the fire and police departments of that jurisdiction? (d)(1)(iii)		
In the event of breakdown or collision of the vehicle transporting explosives, are procedures established whereby local fire and police departments will be promptly notified to help safeguard such emergencies? (d)(1)(iii)		
Are explosives transferred from one vehicle to another only when proper and qualified supervision is provided? (d)(1)(iii)		
Are blasting caps or electric blasting caps prohibited from being transported over the highways on the same vehicles with other explosives? (d)(1)(iv)		
Transportation Vehicles. (d)(2)		
Are all vehicles used for transporting explosives sufficiently strong to carry the load, and are they in good mechanical condition? (d)(2)(i)		
Are all such vehicles that do not have a closed body provided with a flameproof and moistureproof tarpaulin over the body, for protection against moisture and sparks? (d)(2)(i)		

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(d) Transportation of Explosives

YES NO

Do all vehicles used for transportation have tight floors? (d)(2)(i)

Are all spark-producing metals in such vehicles on the inside of the body covered with wood or other nonsparking materials? (d)(2)(i)

Are precautions taken to insure that packages of explosives will not be loaded above the sides of an open-body vehicle? (d)(2)(i)

Is every vehicle used for transporting explosives and oxidizing materials marked in accordance with the following: (d)(2)(ii)(a)

Commodity:
Explosives, Class A, any quantity or a combination of Class A and Class B explosives.

Type of marking or placard:
Explosives A (red letters on white background).

Commodity:
Explosives, Class B, any quantity.

Type of marking or placard:
Explosives B (red letters on white background).

Commodity:
Oxidizing material (blasting agents, ammonium nitrate, etc.), 1,000 pounds or more gross weight.

Type of marking or placard:
Oxidizers (yellow letters on black background). (d)(2)(ii)(a)

Are the placards on the front, rear, and on the sides of each vehicle or trailer while it is carrying explosives or other dangerous articles? (d)(2)(ii)(c)

When any vehicle or cargo carrying body contains more than one kind of explosive or oxidizing material in excess of 1,000 pounds, is it marked "Dangerous", in addition to the placards required? (d)(2)(ii)(d)

Does each vehicle or cargo carrying body used in combination with one another have the markings as required by items (a) and (c) above? (d)(2)(ii)(e)

Does each motor vehicle used for transporting explosives have a minimum of two extinguishers, having a rating of at least 10-BC? (d)(2)(iii)

Are these extinguishers listed or approved by Underwriters Laboratories, Inc., or the Factory Mutual Engineering Corporation? (d)(2)(iii)(a)

Are extinguishers filled and ready for immediate use? (d)(2)(iii)(b)

Are extinguishers located near the driver's seat? (d)(2)(iii)(b)

Are procedures established whereby extinguishers will be examined periodically by a competent person? (d)(2)(iii)(b)

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(d) Transportation of Explosives .

YES NO

Are all motor vehicles used for transporting explosives given an inspection to determine that they are in a safe, proper condition?

(a) Are fire extinguishers filled and in working order?
(b) Is all electrical wiring completely protected and securely fastened to prevent short-circuiting?
(c) Is the chassis, motor, pan, and underside of the body reasonably clean and free of excess oil and grease?
(d) Is the fuel tank and feedline secure, without leaks?
(e) Do the brakes, lights, horn, windshield wipers, and steering apparatus function properly?
(f) Are tires checked for proper inflation and for defects?
(g) Is the vehicle in proper condition in every other respect and acceptable for handling explosives? (d)(2)(iv)

Operation of Transportation Vehicles. (d)(3)

Are all vehicles transporting explosives driven by, and in the charge of, a driver who is familiar with the traffic regulations, State laws, and the provisions of this section? (d)(3)(i)

Are precautions taken to insure that no vehicle transporting explosives will be parked before reaching its destination on any public street adjacent to or in proximity to any place where people work, congregate, or assemble, except under emergency conditions? (d)(3)(ii)

Is every motor vehicle transporting any quantity of Class A or Class B explosives attended by a driver or other attendant of the motor carrier at all times? (d)(3)(iii)

Has the attendant been made aware of the class of the explosives material in the vehicle and of its inherent dangers? (d)(3)(iii)

Has the attendant been instructed in the measures and procedures to be followed in order to protect the public from these dangers? (d)(3)(iii)

Has he been made familiar with the vehicle to which he is assigned? (d)(3)(iii)

Has he been trained, and is he supplied with the necessary means, and authorized to move the vehicle when required? (d)(3)(iii)

Are precautions taken to insure that the driver of the vehicle understands that the word "attended" means when he or another attendant is physically on or in the vehicle, or has the vehicle within his field of vision and can reach it quickly and without any kind of interference? (d)(3)(iii)(a)

Does the driver understand that the word "attended" also means that he or the attendant is awake, alert, and not engaged in other duties or activities which may divert his attention from the vehicle, except for necessary communication with public officers, or representatives of the carrier, shipper, or consignee, or except for necessary absence from the vehicle to obtain food or to provide for his physical comfort? (d)(3)(iii)(a)

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(d) Transportation of Explosives .

	YES	NO
Have precautions been taken to insure that the driver understands that an explosive-laden vehicle may be left unattended if parked within a securely fenced or walled area with all gates or entrances locked where parking of such vehicle is otherwise permissible, or at a magazine site established solely for the purpose of storing explosives? (d)(3)(iii)(b)		
Are the following items prohibited from being carried in the body of any motor truck and/or vehicle transporting explosives: (1) spark-producing metal, (2) spark-producing metal tools, (3) oils, (4) matches, (5) firearms, (6) electric storage batteries, (7) flammable substances, (8) acids, (9) oxidizing materials, or (10) corrosive compounds? (d)(3)(iv) **Exception:** Unless the loading of such dangerous articles and the explosives comply with U.S. Dept. of Transportation regulations.		
Are precautions taken to insure that vehicles transporting explosives will avoid congested areas and heavy traffic? (d)(3)(v)		
Are precautions taken to insure that vehicles transporting explosives will use routes through congested areas that have been designated by local authorities? (d)(3)(v)		
Are precautions taken to insure that delivery will only be made to authorized persons and into authorized magazines or authorized temporary storage or handling areas? (d)(3)(vi)		
(e) Use of Explosives and Blasting Agents. *General Provisions.* (e)(1) While explosives are being handled or used, are precautions taken to insure that smoking is prohibited, and that no one near the explosives shall possess matches, open lights or other fire or flame? (e)(1)		
Are precautions taken to insure that persons handling explosives are not under the influence of intoxicating liquids, narcotics, or other dangerous drugs? (e)(1)(i)		
Are original containers or Class II magazines used for taking detonators and other explosives from storage magazines to the blasting area? (e)(1)(ii)		
Is a blast covered before firing by a mat so constructed that it is capable of preventing fragments from being thrown when blasting is done in congested areas or in close proximity to structures or any other installation that may be damaged? (e)(1)(iii)		
Do persons authorized to prepare explosive charges or conduct blasting operations use every reasonable precaution to insure the safety of the general public and workmen? (e)(1)(iv)		
Are blasting operations only conducted during daylight hours? (e)(1)(v)		
Where blasting is being conducted in the vicinity of gas, electric, water, fire alarm, telephone, telegraph, and steam utilities, does the blaster notify the appropriate representatives of such utilities at least 24 hours in advance of the blasting? (e)(1)(vi)		
Is the verbal notice confirmed with a written notice following notification? (e)(1)(vi)		

1910.109 – EXPLOSIVES AND BLASTING AGENTS
(e) Use of Explosives and Blasting Agents .

	YES	NO
Are precautions taken to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent powerlines, dust storms, or other sources of extraneous electricity? (e)(1)(vii)		
Do these precautions include: *(a)* The suspension of all blasting operations and removal of persons from the blasting area during the approach and progress of an electric storm?		
(b) Are signs posted warning against the use of mobile radio transmitters on all roads within 350 feet of the blasting operations? (e)(1)(vii)		
Storage At Use Sites. (e)(2) Are empty boxes and paper and fiber packing materials which have previously contained high explosives prohibited from being used for any other purpose? (e)(2)(i)		
Are such empty boxes and paper and fiber packing materials destroyed by burning at an approved isolated location out of doors, and are precautions taken to insure that no person is nearer than 100 feet after the burning has started? (e)(2)(i)		
Are precautions taken to insure that containers of explosives shall not be opened in any magazine or within 50 feet of any magazine? (e)(2)(ii)		
Are precautions taken to insure that in opening kegs or wooden cases, no sparking metal tools will be used? (e)(2)(ii)		
Are explosives or blasting equipment that is obviously deteriorated or damaged prohibited from being used? (e)(2)(iii)		
Are precautions taken to insure that no explosives will be abandoned? (e)(2)(iv)		
Loading of Explosives in Blast Holes. (e)(3) Are all drill holes sufficiently large to admit freely the insertion of the cartridges of explosives? (e)(3)(i)		
Is all tamping done with wood rods with no exposed metal parts? (e)(3)(ii)		
Is violent tamping prohibited? (e)(3)(ii)		
Are precautions taken to insure that primed cartridges are not tamped? (e)(3)(ii)		
When pneumatically loading blasting agents over blasting caps, is semiconductive delivery hose used and is the equipment bonded and grounded? (e)(3)(iii)		
Are precautions taken to insure that no holes will be loaded except those to be fired in the next round of blasting? (e)(3)(iv)		
After holes are loaded, are all remaining explosives immediately returned to an authorized magazine? (e)(3)(iv)		
Is drilling prohibited from being started until all remaining butts of old holes are examined with a wooden stick for unexploded charges? (e)(3)(v)		
If any unexploded charges are found, are they refired before work proceeds? (e)(3)(v)		
Is the deepening of drill holes which have contained explosives prohibited? (e)(3)(vi)		

1910.109 – EXPLOSIVES AND BLASTING AGENTS
(e) Use of Explosives and Blasting Agents.

	YES	NO
After loading for a blast is completed, are all excess blasting caps or electric blasting caps and other explosives immediately returned to their separate storage magazines? (e)(3)(vii)		
Initiation of Explosive Charges. (e)(4) When fuse is used, is the blasting cap securely attached to the safety fuse with a standard ring-type cap crimper? (e)(4)(ii)		
Are all primers assembled at least 50 feet from any magazine? (e)(4)(ii)		
Are primers made up only as required for each round of blasting? (e)(4)(iii)		
Are precautions taken to insure that no blasting cap will be inserted in the explosives without first making a hole in the cartridge for the cap with a wooden punch of proper size or standard cap crimper? (e)(4)(iv)		
Are explosives prohibited from being extracted from a hole that has once been charged or has misfired, unless it is impossible to detonate the unexploded charge by insertion of a fresh additional primer? (e)(4)(v)		
If there are any misfires while using cap and fuse, are persons required to remain away from the charge for at least 1 hour? (e)(4)(vi)		
If there are misfires when electric blasting caps are used, are persons required to remain away from the area for at least 30 minutes? (e)(4)(vi)		
Are misfires handled only under the direction of the person in charge of the blasting, and are all wires carefully traced and a search made for unexploded charges? (e)(4)(vi)		
Are blasters required to use only blasting galvanometers when testing circuits? (e)(4)(vii)		
Is only the employee making leading wire connections in electrical firing allowed to fire the shot? (e)(4)(viii)		
Are leading wires required to remain shorted and not connected to the blasting machine or other source of current until the charge is to be fired? (e)(4)(viii)		
Warning Required. (e)(5) Before a blast is fired, does the person in charge insure that all surplus explosives are in a safe place? (e)(5)		
Before a blast is fired, does the person in charge insure that all persons and vehicles are at a safe distance or under sufficient cover? (e)(5)		
Before a blast is fired, does the person in charge provide a loud warning that is adequate? (e)(5)		
(f) Explosives at Piers, Railway Stations, and Cars or Vessels Not Otherwise Specified in This Standard. *Railway Cars.* (f)(1) Is the having or keeping of explosives in railway cars prohibited, except in an emergency and with the permission of the local authorities? (f)(1)		

1910.109 – EXPLOSIVES AND BLASTING AGENTS
(f) Explosives at Piers, Railway Stations, and Cars or Vessels Not Otherwise Specified in This Standard.

	YES	NO
In such emergencies, and with the permission of the local authorities, do cars containing explosives and the contents and methods of loading comply with the U.S. Department of Transportation Regulations for the Transportation of Explosives, 49 CFR Chapter I? (f)(1)		
Packing and Marking. (f)(2) Is the delivery of any explosive to any carrier prohibited in all respects, including marking and packing, to the U.S. Department of Transportation Regulations for the Transportation of Explosives? (f)(2)		
Marking Cars. (f)(3) Does every railway car containing explosives which has reached its designation, or is stopped in transit so as no longer to be in interstate commerce, have attached to both sides and ends of the car, cards with the words "Explosives-Handle Carefully-Keep Fire Away" in red letters at least 1½ inches high on a white background? (f)(3)		
Storage. (f)(4) Are all explosives at a railway facility, truck terminal, pier, wharf, harbor facility, or airport terminal, kept in a safe place, isolated as far as practicable and in such manner that they can be easily and quickly removed? (f)(4)		
Hours of Transfer. (f)(5) Are explosives delivered to or received from any railway station, truck terminal, pier, wharf, harbor facility, or airport terminal done only between the hours of sunset and sunrise? (f)(5)		
(g) Blasting Agents. *General.* (g)(1) Except as covered in the following items of this paragraph, are blasting agents, excluding water gels, transported, stored, and used in the same manner as explosives? (g)(1)		
Fixed Location Mixing. (g)(2) Do buildings used for the mixing of blasting agents conform to the following requirements: *(a)* Is the building of noncombustible construction, or does it have sheet metal over wood studs?		
(b) Are the floors in a mixing plant of concrete or of other nonabsorbent materials?		
(c) Are all fuel oil storage facilities separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building?		

YES NO

(d) Is the building well ventilated?

(e) Are all direct sources of heat provided exclusively from units located outside the mixing building?

(f) Are all internal-combustion engines used for electric power generation located outside the mixing plant building?

Or as an alternative, are all internal combustion engines, used for electric power generation, in a properly ventilated space and isolated by a firewall?

Is the exhaust system on all such engines located so any spark emission cannot be a hazard to any materials in or adjacent to the plant? (g)(2)(ii)

Does the equipment used for mixing blasting agents conform to the following requirements:

(a) Is the design of the mixer such that it will minimize the possibility of frictional heating, compaction, and especially confinement?

Are all bearings and drive assemblies mounted outside the mixer and protected against the accumulation of dust?

Are all surfaces accessible for cleaning?

(b) Is all mixing and packaging equipment constructed of materials compatible with the fuel-ammonium nitrate composition?

(c) Are suitable means provided to prevent the flow of fuel oil to the mixer in case of fire?

Is there an automatic spring-loaded shutoff valve with fusible link installed in gravity flow systems? (g)(2)(iii)

Is consideration given to the provisions of the following items when determining blasting agent compositions:

(a) Is the sensitivity of the blasting agent determined by means of a No. 8 test blasting cap at regular intervals and after every change in formulation?

(b) Due to the fact that oxidizers of small particle size, such as crushed ammonium nitrate prills or fines, are more sensitive than coarser products, are they handled with greater care?

(c) Are hydrocarbon liquid fuels with flashpoints lower than that of No. 2 diesel fuel oil 125°F. minimum prohibited from being used?

(d) Is crude oil and crankcase oil prohibited from being used?

(e) Are metal powders such as aluminum kept dry and stored in containers or bins which are moisture-resistant or weathertight?

Are solid fuels used in such manner as to minimize dust explosion hazards?

(f) Is the use of peroxides and chlorates prohibited? (g)(2)(iv)

Do all electrical switches, controls, motors, and lights located in the mixing room conform to the requirements in subpart S of this part for Class II, Division 2 locations? (g)(2)(v)

If not, are they located outside of the mixing room? (g)(2)(v)

Is the frame of the mixer and all other equipment that may be used electrically bonded, and is it provided with a continuous path to the ground? (g)(2)(v)

YES NO

Do the safety precautions at mixing plants include the following requirements:

(a) Are floors constructed so as to eliminate floor drains and piping into which molten materials could flow and be confined in case of a fire?

(b) Are floors and equipment of the mixing and packaging room regularly and thoroughly cleaned

(c) Is the entire mixing and packaging plant cleaned regularly and thoroughly to prevent excessive accumulation of dust?

(d) Are smoking, matches, open flames, spark-producing devices, and firearms prohibited inside of or within 50 feet of any building or facility used for the mixing of blasting agents?

Exception: Firearms carried by guards.

(e) Is the land surrounding the mixing plant kept clear of brush, dried grass, leaves, and other materials for a distance of at least 25 feet?

(f) Are empty ammonium nitrate bags disposed of daily in a safe manner?

(g) Is welding or the use of open flames used in or around the mixing or storage area of the plant prohibited, unless the equipment or area has been completely washed down and all oxidizer material removed?

(h) Before welding or repairs to hollow shafts, is all oxidizer material removed from the outside and inside of the shaft, and is the shaft vented with a minimum one-half inch diameter opening?

(i) Are explosives prohibited inside of or within 50 feet of any building or facility used for the mixing of blasting agents? (g)(2)(vi)

Bulk Delivery and Mixing Vehicles. (g)(3)

The following items apply to off-highway private operations as well as to all public highway movements. (g)(3)(i)

Does the bulk vehicle body for delivering and mixing blasting agents conform with the following requirements:

(a) Is the body constructed of noncombustible materials?

(b) Do vehicles used to transport bulk premixed blasting agents on public highways have closed bodies?

(c) Are moving parts of the mixing system designed so as to prevent a heat buildup?

Do shafts or axles which contact the product have outboard bearings with 1-inch minimum clearance between the bearings and the outside of the product container?

Is particular attention given to the clearances on all moving parts?

(d) Is the bulk delivery vehicle sufficiently strong to carry the load without difficulty and in good mechanical condition? (g)(3)(ii)

Does the operation of bulk delivery vehicles conform to the following requirements, which include the placarding requirements as specified by the Department of Transportation?

(a) Is the operator trained in the safe operation of the vehicle, together with its mixing, conveying, and related equipment?

Are precautions taken to insure that the operator is familiar with the commodities being delivered and the general procedure for handling emergency situations?

(b) Is the hauling of either blasting caps or other explosives, but not both, prohibited on bulk trucks, except where a special wood or nonferrous-lined container is installed for the explosives?

Are such blasting caps or other explosives contained in Department of Transportation-specified shipping containers: see 49 CFR Chapter I.

(c) Are all persons prohibited from smoking, carrying matches or any flame-producing device, or carrying any firearms while in or about bulk vehicles effecting the mixing transfer or down-the-hole loading of blasting agents at or near the blasting site?

(d) Are precautions taken to insure that the vehicle will not be driven over, or drag hoses over the firing lines, cap wires, or explosive materials?

Are precautions taken to insure that the driver, in moving the vehicle, has the assistance of a second person to guide his movements?

(e) Is the intransit mixing of materials prohibited?(g)(3)(iii)

Does pneumatic loading from bulk delivery vehicles into blastholes primed with electric blasting caps or other static-sensitive systems conform to the following requirements:

(a) Is there a positive grounding device used to prevent the accumulation of static electricity?

(b) Is a discharge hose used that has a resistance range that will prevent conducting stray currents, but that is conductive enough to bleed off static buildup?

(c) Has a qualified person evaluated all systems to determine if they will adequately dissipate static under potential field conditions? (g)(3)(iv)

Is the repair of bulk delivery vehicles in conformance with the following requirements:

(a) Is welding or open flames prohibited on or around any part of the delivery equipment unless it has been completely washed down and all oxidizer material removed?

(b) Prior to welding or making repairs to hollow shafts, is the shaft thoroughly cleaned inside and out and vented with a minimum one-half-inch diameter opening? (g)(3)(v)

Bulk Storage Bins. (g)(4)

Is the bin constructed of compatible materials, waterproof, and is it adequately supported and braced to withstand the combination of all loads, including impact forces arising from product movement, within the bin and accidental vehicle contact with the support legs? (g)(4)(i)

Is the bin discharge gate designed to provide a closure tight enough to prevent leakage of the stored product? (g)(4)(ii)

Are provisions made so that the gate can be locked? (g)(4)(ii)

Storage of Blasting Agents and Supplies. (g)(5)

Are blasting agents and oxidizers used for mixing of blasting agents stored in accordance with the following items? (g)(5)(i)

Are blasting agents or ammonium nitrate, when stored in conjunction with explosives, stored in the manner set forth in paragraph (c) of this section for explosives, which starts on page H-41 of this checklist? (g)(5)(i)(a)

In computing the total quantity of explosives for determining distance requirements, is the mass of blasting agents and one-half the mass of ammonium nitrate used? (g)(5)(i)(a)

Are blasting agents, when stored entirely separate from explosives, stored in the manner set forth in paragraph (c) on page H-41 of this checklist? Or, as an alternative: (g)(5)(i)(b)

In one-story warehouses which comply with the following requirements:

(1) Are they noncombustible or fire-resistive;
(2) Are they constructed so as to eliminate open floor drains and piping into which molten materials could flow and be confined in case of fire;
(3) Are they weather resistant;
(4) Are they well ventilated; and
(5) Are they equipped with a strong door kept securely locked except when open for business? (g)(5)(i)(b)

Is Table H-22 (see Appendix) used to determine the locating of semi-trailer or full-trailer vans with respect to one another? (g)(5)(i)(c)

Are trailers provided with substantial means for locking? (g)(5)(i)(c)

Are such trailer doors kept locked, except during the time of placement and removal of stocks of blasting agents? (g)(5)(i)(c)

Are warehouses used for the storage of blasting agents located separate from explosives as set forth in the following items? (g)(5)(ii)

Is Table H-22 (see Appendix) used for the location of warehouses with respect to one another? (g)(5)(ii)(a)

When both blasting agents and ammonium nitrate are handled or stored, and in determining the proper distance for compliance with Table H-21 (see Appendix), is one-half the mass of the ammonium nitrate added to the mass of the blasting agent when computing the total quantity of the explosives? (g)(5)(ii)(b)

Are smoking, matches, open flames, spark-producing devices, and firearms prohibited inside of or within 50 feet of any warehouse used for the storage of blasting agents? (g)(5)(iii)

Are combustible materials prohibited from being stored within 50 feet of warehouses used for the storage of blasting agents? (g)(5)(iii)

Is the interior of warehouses used for the storage of blasting agents kept clean and free from debris and empty containers? (g)(5)(iv)

Are spilled materials cleaned up promptly and safely removed? (g)(5)(iv)

Are combustible materials, flammable liquids, corrosive acids, chlorates, or nitrates prohibited from being stored in any warehouse used for blasting agents? (g)(5)(iv)

Exception: Unless separated therefrom by a fire resistive separation of not less than 1 hour resistance.

1910.109 – EXPLOSIVES AND BLASTING AGENTS
(g) Blasting Agents.

YES NO

Are piles of ammonium nitrate adequately separated from readily combustible fuels? (g)(5)(v)

Are warehouses containing ammonium nitrate adequately separated from readily combustible fuels? (g)(5)(v)

Are caked oxidizers, either in bags or in bulk, prohibited from being loosened by blasting? (g)(5)(vi)

Is every warehouse used for the storage of blasting agents under the supervision of a competent person? (g)(5)(vii)

Transportation of Packaged Blasting Agents. (g)(6)

When blasting agents are transported in the same vehicle with explosives, are the requirements of the items contained in this checklist under 1910.109(d) complied with? (g)(6)(i)

Are vehicles transporting blasting agents driven by, and are they in charge of a driver who possesses a valid motor vehicle operator's license, and is familiar with the State's vehicle and traffic laws? (g)(6)(ii)

Are matches, firearms, acids, or other corrosive liquids prohibited from being carried in the bed or body of any vehicle containing blasting agents? (g)(6)(iii)

Are persons who are permitted to ride upon, drive, load, or unload a vehicle containing blasting agents, prohibited from smoking, or being under the influence of intoxicants, narcotics, or other dangerous drugs? (g)(6)(iv)

Are vehicles transporting blasting agents in a safe operating condition at all times? (g)(6)(vi)

Use of Blasting Agents. (g)(7)

Are the items contained in this checklist under 1910.109(e) on page H-45 used to insure that persons using blasting agents are in conformity therewith? (g)(7)

(h) Water Gel (Slurry) Explosives and Blasting Agents.

General Provisions. (h)(1)

Are water gels transported, stored and used in the same manner as explosives or blasting agents, and in compliance with this checklist as applicable under Section 1910.109, unless otherwise specifically authorized in this paragraph? (h)(1)

Types and Classifications. (h)(2)

Are water gels containing a substance in itself classified as an explosive, classified as an explosive and manufactured, transported, stored, and used as specified for "explosives" in this checklist? (h)(2)(i)

1910.109 – EXPLOSIVES AND BLASTING AGENTS
(h) Water Gel (Slurry)
Explosives and Blasting Agents.

YES NO

Exception: As noted in the item in (iv) below.

Are water gels containing no substance in itself classified as an explosive, but which are cap-sensitive as defined in paragraph (a) of this section under Blasting Agent, classified as explosive and manufactured, transported, stored and used as specified for "explosives" in this section? (h)(2)(ii)

Are water gels containing no substance in itself classified as an explosive and which are not cap-sensitive as defined in paragraph (a) under Blasting Agent, classified as blasting agents and manufactured, transported, stored, and used as specified for "blasting agents", and do they comply with the applicable portions of this checklist? (h)(2)(iii)

NOTE: When tests on specific formulations of water gels result in Department of Transportation classification as a Class B explosive, bullet-resistant magazines are not required. (h)(2)(iv)

Fixed Location Mixing. (h)(3)

Do buildings used for the mixing of water gels conform to the requirements of the following items:

(a) Are buildings of noncombustible construction or sheet metal on wood studs?

(b) Are floors in a mixing plant of concrete or of other nonabsorbent materials?

(c) Where fuel oil is used, are fuel oil storage facilities separated from the mixing plant and located in such a manner that in case of tank rupture, the oil will drain away from the mixing plant building?

(d) Is the building well ventilated?

(e) Are all direct sources of heat provided exclusively from units located outside of the mixing building?

(f) Are all internal-combustion engines used for electric power generation located outside the mixing plant building, or properly ventilated and isolated by a firewall? Are the exhaust systems on all such engines located so any spark emission cannot be a hazard to any materials in or adjacent to the plant? (h)(3)(ii)

Do the ingredients of water gels conform to the requirements as listed below? (h)(3)(iii)

Are the ingredients that in themselves are classified as Class A or Class B explosives stored in conformity with paragraph 1910.109(c)? (h)(3)(iii)(a)

Are spills or leaks of nitrate-water solutions, which may contaminate combustible materials, cleaned up immediately? (h)(3)(iii)(b)

Are metal powders such as aluminum kept dry and are they stored in containers or bins which are moisture-resistant or weathertight? (h)(3)(iii)(c)

Question	YES	NO
Are solid fuels used in such a manner as to minimize dust explosion hazards? (h)(3)(iii)(c)		
Are precautions taken to insure that ingredients are not stored with incompatible materials? (h)(3)(iii)(d)		
Is the use of peroxides and chlorates prohibited? (h)(3)(iii)(e)		
Does mixing equipment comply with the requirements of the following items? (h)(3)(iv)		
Is the design of the processing equipment, including mixing and conveying equipment, compatible with the relative sensitivity of the materials being handled? (h)(3)(iv)(a)		
Is the equipment designed to minimize the possibility of frictional heating, compaction, overloading, and confinement? (h)(3)(iv)(a)		
Are the equipment and handling procedures designed to prevent the introduction of foreign objects or materials? (h)(3)(iv)(b)		
Are mixers, pumps, valves, and related equipment designed to permit regular and periodic flushing, cleaning, dismantling, and inspection? (h)(3)(iv)(c)		
Does all electrical equipment including wiring, switches, controls, motors, and lights, conform to the requirements of subpart S? (h)(3)(iv)(d)		
Are all electric motors and generators provided with suitable overload protection devices? (h)(3)(iv)(e)		
Are electrical generators, motors, proportioning devices, and all other electrical enclosures electrically bonded? (h)(3)(iv)(e)		
Is the grounding conductor to all such electrical equipment effectively bonded to the service-entrance ground connection and to all equipment ground connections in a manner so as to provide a continous path to ground? (h)(3)(iv)(e)		
Do mixing facilities comply with the fire prevention requirements? (h)(3)(v)		
In all areas where residues or spilled materials may accumulate, because of mixing, loading, and ingredient transfer, are spilled materials cleaned up periodically? (h)(3)(v)(a)		
Is there a cleaning and collection system provided for dangerous residues? (h)(3)(v)(a)		
Is there a daily visual inspection made of mixing, conveying, and electrical equipment to establish that such equipment is in good operating condition? (h)(3)(v)(b)		
Is there a program of systematic maintenance conducted on a regular schedule? (h)(3)(v)(b)		
Bulk Delivery and Mixing Vehicles. (h)(4)		
Does the design of vehicles comply with the following requirements: (h)(4)(i)		
Do vehicles used over public highways for the bulk transportation of water gels or of ingredients classified as dangerous commodities, meet the requirements of the Department of Transportation, in addition to the items listed under 1910.109(d) and (g)(6) of this checklist? (h)(4)(i)(a)		
When electric power is supplied by a self-contained motor generator located on the vehicle, is the generator at a point separate from where the water gel is discharged? (h)(4)(i)(b)		

Question	YES	NO
Does the design of processing equipment and general requirements conform to the items under 1910.109(h)(3)(iii) and (iv) of this checklist? (h)(4)(i)(c)		
Is there a positive action parking brake which will set the wheel brakes on at least one axle provided on bulk delivery vehicles? (h)(4)(i)(d)		
Are precautions taken to insure that this brake will be used during bulk delivery operations? (h)(4)(i)(d)		
Are wheel chocks provided and are they used whenever conditions may require in addition to the parking brakes? (h)(4)(i)(d)		
Does the operation of bulk delivery and mixing vehicles comply with the following requirements? (h)(4)(ii)		
Are vehicles carrying water gel explosives or blasting agents placarded in accordance with the Department of Transportation regulations? (h)(4)(ii)(a)		
Is the operator trained in the safe operation of the vehicle? (h)(4)(ii)(b)		
Is the operator trained in the mixing, conveying, and related equipment of the bulk vehicle? (h)(4)(ii)(b)		
Is the operator familiar with the commodities being delivered and the general procedure for handling emergency situations? (h)(4)(ii)(b)		
Is there a special wood or nonferrous-lined container provided when hauling blasting caps or other explosives on bulk trucks? (h)(4)(ii)(c)		
NOTE: Blasting caps or other explosives cannot be hauled together.		
Are such blasting caps or other explosives in Department of Transportation-specified shipping containers? (h)(4)(ii)(c)		
Are persons prohibited from smoking, carrying matches or any flame-producing device, or from carrying firearms while in or about bulk vehicles? (h)(4)(ii)(d)		
Is due caution exercised in the movement of the vehicle in the blasting area to avoid driving the vehicle over, or dragging hoses over, firing lines, cap wires, or explosive materials? (h)(4)(ii)(e)		
Is there a second person designated to guide the driver to preclude the possibility of the above conditions in the above items? (h)(4)(ii)(e)		
Is the intransit mixing of materials prohibited? (h)(4)(ii)(f)		
When choosing a location for water gel or ingredient transfer from a support vehicle into the borehole loading vehicle, are precautions taken to insure that the transfer will not be in the area where the boreholes are loaded or in the process of being loaded? (h)(4)(ii)(g)		
(i) Storage of Ammonium Nitrate.		
Scope and Definitions. (i)(1)		
This paragraph applies to the storage of ammonium nitrate in the form of crystals, flakes, grains, or prills including fertilizer grade, dynamite grade, nitrous oxide grade, technical grade, and other mixtures containing 60 percent or more ammonium nitrate by weight. (i)(1)(a)		
Exception: This **does not** apply to blasting agents.		

1910.109 – EXPLOSIVES AND BLASTING AGENTS
(i) Storage of Ammonium Nitrate.

	YES	NO
See item (d) below for further restrictions on the storage of ammonium nitrate. (i)(1)(a)		
This paragraph **does not** apply to the transportation of ammonium nitrate. (i)(1)(b)		
This paragraph **does not** apply to storage of ammonium nitrate under the jurisdiction of and in compliance with the regulations of the U.S. Coast Guard (46 CFR Parts 146-149). (i)(1)(c)		
The storage of ammonium nitrate and ammonium nitrate mixtures that are more sensitive than allowed by the "Definition of Test Procedures for Ammonium Nitrate Fertilizer" is prohibited. (i)(1)(d)		
This paragraph **does not** apply to the production of ammonium nitrate or to the storage of ammonium nitrate on the premises of the producing plant. (i)(1)(e)		
General Provisions. (i)(2)		
In the storage of ammonium nitrate in quantities of 1,000 pounds or more, are the items in this checklist complied with? (i)(2)(i)		
In large quantity storage, is due consideration given to the fire and explosion hazards, including exposure to toxic vapors from burning or decomposing ammonium nitrate? (i)(2)(ii)		
Are storage buildings prohibited from having basements unless the basements are open on at least one side? (i)(2)(iii)(a)		
Are storage buildings prohibited from being over one story in height? (i)(2)(iii)(a)		
Do storage buildings have adequate ventilation, or are they of such construction that they will be self-ventilating in the event of fire? (i)(2)(iii)(b)		
Is the wall on the exposed side of a storage building within 50 feet of a combustible building, forest, piles of combustible materials and similar exposure hazards of fire-resistive construction? (i)(2)(iii)(c)		
As an alternate to the above item, are there other suitable means of exposure protection provided? (i)(2)(iii)(c)		
Are the roof coverings on these buildings of Class C or better, as defined in the manual on Roof Coverings, NFPA 203M-1970? (i)(2)(iii)(c)		
Is all flooring in storage and handling areas of noncombustible material or protected against impregnation by ammonium nitrate? (i)(2)(iii)(d)		
Are open drains, traps, tunnels, pits or pockets into which any molten ammonium nitrate could flow and be confined in the event of fire prohibited in the floors of storage buildings? (i)(2)(iii)(d)		
Are buildings and structures dry and free from water seepage through the roof, walls, and floors? (i)(2)(iii)(f)		
Storage of Ammonium Nitrate in Bags, Drums, or Other Containers. (i)(3)		
Do bags and containers used for ammonium nitrate comply with the specifications and standards required for use in interstate commerce (see 49 CFR Chapter I)? (i)(3)(i)(a)		
The above item **does not** apply to the containers used on the premises in the actual manufacturing or processing. (i)(3)(i)(b)		

1910.109 – EXPLOSIVES AND BLASTING AGENTS
(i) Storage of Ammonium Nitrate.

	YES	NO
Are containers of ammonium nitrate not accepted for storage when the temperature of the ammonium nitrate exceeds 130°F.? (i)(3)(ii)(a)		
Are bags of ammonium nitrate prohibited from being stored within 30 inches of the storage building walls and partitions? (i)(3)(ii)(b)		
Is the height of piles of ammonium nitrate limited to 20 feet or less? (i)(3)(ii)(c)		
Is the width of piles of ammonium nitrate limited to 20 feet or less, and is the length of the piles of ammonium nitrate limited to 50 feet? (i)(3)(ii)(c)		
Exception: Where the building is of noncombustible construction or is protected by automatic sprinklers, the length of the piles need not be limited.		
Is the stacking of ammonium nitrate closer than 36 inches to the roof or supporting and spreader beams overhead prohibited? (i)(3)(ii)(c)		
Is there a clear space of at least 36 inches between piles provided? (i)(3)(ii)(d)		
Is there at least one service or main aisle provided that is not less than 4 feet in width? (i)(3)(ii)(d)		
Storage of Bulk Ammonium Nitrate. (i)(4)		
Are warehouses provided with adequate ventilation, or are they capable of adequate ventilation in case of fire? (i)(4)(i)(a)		
Is the height of bulk storage structures limited to 40 feet, unless the structure is of noncombustible material or unless adequate facilities for fighting a roof fire are available? (i)(4)(i)(b)		
Are bins kept clean and free of materials which may contaminate ammonium nitrate? (i)(4)(ii)(a)		
Unless suitably protected, is the use of galvanized iron, copper, lead, and zinc prohibited in bin construction? (i)(4)(ii)(b)		
Are partitions dividing the ammonium nitrate storage from other products which would contaminate the ammonium nitrate of tight construction? (i)(4)(ii)(b)		
Are ammonium nitrate storage bins or piles clearly identified by signs reading "Ammonium Nitrate", with the letters at least 2 inches high? (i)(4)(ii)(c)		
Are piles and bins so sized and arranged that all material in the pile is moved out periodically? (i)(4)(iii)(a)		
Is the height or depth of piles limited by the pressure-setting tendency of the product? (i)(4)(iii)(b)		
Is the height of ammonium nitrate piles kept at least 36 inches below the roof or supporting and spreader beams overhead? (i)(4)(iii)(b)		
Is ammonium nitrate not accepted for storage when the temperature of the product exceeds 130°F.? (i)(4)(iii)(c)		
Is the use of dynamite or other explosives and blasting agents prohibited to break up or loosen caked ammonium nitrate? (i)(4)(iii)(d)		

1910.109 — EXPLOSIVES AND BLASTING AGENTS

(i) Storage of Ammonium Nitrate.

	YES	NO
Contaminants (i)(5)		
Is ammonium nitrate stored in a separate building, or as an alternate is ammonium nitrate separated by approved type firewalls of not less than 1 hour fire-resistance rating from storage of (1) organic chemicals, acids, or other corrosive materials, (2) materials that may require blasting during processing or handling, (3) compressed flammable gases, flammable and combustible materials or other contaminating substances? (i)(5)(i)(a)		
In lieu of the above item under (5)(i)(a), is the ammonium nitrate separated from the materials referred to by a space of at least 30 feet? (i)(5)(i)(b)		
Are flammable liquids such as gasoline, kerosene, solvents, and light fuel prohibited from being stored on the premises except when such storage conforms to the items in this checklist under 1910.106 and when walls and sills or curbs are provided in accordance with items (a) or (b) above? (i)(5)(i)(c)		
Is the storage of LP-Gas prohibited on the premises, except when such storage conforms to this checklist under 1910.110? (i)(5)(i)(d)		
Is the storage of sulfur and finely divided metals prohibited in the same building with ammonium nitrate, except when such storage conforms to 1910.109(a) through (h) of this checklist? (i)(5)(ii)(a)		
Is the storage of explosives and blasting agents prohibited in the same building with ammonium nitrate, except on the premises of makers, distributors, and user-compounders of explosives or blasting agents? (i)(5)(ii)(b)		
Where explosives or blasting agents are stored in separate buildings, are they separated from the ammonium nitrate by the distances and/or barricades specified in Table H-22 (see Appendix), but by at least 50 feet? (i)(5)(ii)(c)		
Does the storage and/or operations on the premises of makers, distributors, and user-compounders of explosives or blasting agents conform with paragraphs (a) through (h) of this checklist? (i)(5)(ii)(d)		
General Precautions. (i)(6)		
Do electrical installations conform to the requirements of subpart S of this part? (i)(6)(i)(a)		
Are electrical installations designed to minimize damage from corrosion? (i)(6)(i)(a)		
In areas where lightning storms are prevalent, is lightning protection provided in accordance with NFPA 78-1968? (i)(6)(ii)		
Are provisions made to prevent unauthorized personnel from entering the ammonium nitrate storage area? (i)(6)(iii)		
Fire Protection. (i)(7)		
Is not more than 2,500 tons (2270 tonnes) of bagged ammonium nitrate stored in a building or structure not equipped with an automatic sprinkler system? (i)(7)(i)		
Are sprinkler systems of the approved type and installed in accordance with 1910.159? (i)(7)(i)		
Are suitable fire control devices such as small hose or portable fire extinguishers provided throughout the warehouse and in the loading and unloading areas? (i)(7)(ii)(a)		
Do fire control devices comply with the requirements of 1910.157 and 1910.158? (i)(7)(ii)(a)		
(j) Small Arms Ammunition, Small Arms Primers, and Small Arms Propellants.		

1910.109 — EXPLOSIVES AND BLASTING AGENTS

(i) Storage of Ammonium Nitrate.

	YES	NO
Scope. (j)(1)		
The following items **do not** apply to in-process storage and manufacture of small arms ammunition, small arms primers, and smokeless propellants. (j)(1)		
Small Arms Ammunition. (j)(2)		
Is small arms ammunition separated from flammable liquids, flammable solids as classified in 49 CFR Part 172, and from oxidizing materials, by a fire-resistive wall of 1-hour rating or by a distance of 25 feet? (j)(2)(ii)		
Is the storage of small arms ammunition together with Class A or Class B explosives prohibited unless the storage facility is adequate for this latter storage? (j)(2)(iii)		
Smokeless Propellants. (j)(3)		
Are all smokless propellants stored in shipping containers as specified in 49 CFR 173.93? (j)(3)(i)		
Are commercial stocks of smokeless propellants over 20 pounds and less than 100 pounds stored in portable wooden boxes having a wall of at least 1-inch nominal thickness? (j)(3)(iii)		
Are commercial stocks in quantities exceeding 100 pounds but less than 750 pounds stored in nonportable storage cabinets having wooden walls of at least 1 inch nominal thickness? (j)(3)(iv)		
Is the storage in any one cabinet limited to 400 pounds? (j)(3)(iv)		
Are quantities of smokless propellants in excess of 750 pounds stored in magazines that comply with the items in this checklist under 1910.109(c)? (j)(3)(v)		
Small Arms Ammunition Primers. (j)(4)		
Are small arms ammunition primers stored only in the original shipping container in accordance with requirements of 49 CFR 173.107? (j)(4)(i)		
Are small arms ammunition primers separated from flammable liquids or flammable solids, as classified in 49 CFR Part 172, and oxidizing materials by a fire-resistive wall of 1-hour rating or by a distance of 25 feet? (j)(4)(iii)		
Is the number of small arms ammunition primers that can be stored in any one building limited to 750,000? (j)(4)(iv)		
Exception: Except as noted in (v) below.		
Is any one pile of small arms ammunition primers limited to 100,000? (j)(4)(iv)		
Are piles at least 15 feet apart? (j)(4)(iv)		
Are quantities in excess of 750,000 small arms ammunition primers stored in magazines that comply with the items in this checklist under 1910.109(c)? (j)(4)(v)		
(k) Scope.		
This section applies to the manufacture, keeping, having, storage, sale, transportation and use of explosives, blasting agents and pyrotechnics. The section does not apply to the sale and use (public display) of pyrotechnics, commonly known as fireworks, nor the use of explosives in the form prescribed by the official U.S. Pharmacopeia. (k)(1)		
The manufacture of explosives as defined in paragraph (a)(3) of this section shall also meet the requirements contained in §1910.119. (k)(2)		
The manufacture of pyrotechnics as defined in paragraph (a)(10) of this section shall also meet the requirements contained in §1910.119. (k)(3)		

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

YES NO

(b) Basic Rules.

Odorizing Gases. (b)(1)

Are all liquefied petroleum gases effectively odorized by an approved agent so as to indicate the presence of gas down to a concentration in air of not over one-fifth the lower limit of flammability? (b)(1)(i)

Approval of Equipment and Systems. (b)(2)

Does each system utilizing Department of Transportation containers under 49 CFR Part 178 have container valves, connectors, manifold valve assemblies, and regulators approved? (b)(2)(i)

Does each system for domestic or commercial use utilizing containers of 2,000 gallons or less of water capacity, not constructed in accordance with 49 CFR Part 178, consist of a container assembly and one or more regulators? (b)(2)(ii)

Does the system as a unit or the container assembly as a unit, and the regulator or regulators, comply with the recognized testing laboratories, Underwriters Laboratories, Inc., or Factory Mutual Engineering Corporation? (b)(2)(ii)

Does each regulator, container valve, excess flow valve, gaging device, and relief valve installed on or at the container in systems utilizing containers of over 2,000 gallons water capacity, have their design, construction, and performance determined by listing by Underwriters Laboratories, Inc., or Factory Mutual Engineering Corporation? (b)(2)(iii)

Requirements for Construction and Original Test of Containers. (b)(3)

Are containers used with the following listed systems designed, constructed, and tested in accordance with the Rules for Construction of Unfired Pressure Vessels, Section VIII, Division 2, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 1968:

(1) Systems using other than Department of Transportation containers.
(2) Liquid petroleum gas as a motor fuel.
(3) Liquid petroleum gas systems installed in commercial vehicles.
(4) Liquid petroleum gas service stations. (b)(3)(i)

Exceptions to the above are contained in 1910.110(e)(3)(iii) and 1910.110(g)(2)(i).

Containers constructed according to the 1949 and earlier editions of the ASME Code **do not** have to comply with paragraphs U-2 through U-10 and U-19 of that Code. (b)(3)(ii)

Is the use of containers constructed according to paragraph U-70 in the 1949 and earlier ASME Codes prohibited? (b)(3)(ii)

Do all systems utilizing DOT containers have such containers constructed, tested, and stamped in accordance with DOT specifications effective at the date of their manufacture? (b)(3)(v)

Welding of Containers. (b)(4)

Is all welding accomplished on a container that is subject to internal pressure, done in compliance with the code under which the tank was fabricated? (b)(4)(i)

Is other welding only permitted on saddle plates, lugs, or brackets attached to the container by the tank manufacturer? (b)(4)(i)

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES
(b) Basic Rules.

YES NO

Where repair or modification involving welding of DOT containers is required, is the container returned to the qualified manufacturer making containers of the same type? (b)(4)(ii)

Is such repair or modification made in compliance with DOT regulations? (b)(4)(ii)

Markings on Containers. (b)(5)

Does each container covered in the items under 1910.110(b)(3)(i) of this checklist have a marking as specified in the following? (b)(5)(i)

A marking identifying compliance with the rules of the reference under which the container is constructed? (b)(5)(i)(a)

Other markings required by the rules of the reference under which the container is constructed? (b)(5)(i)(a)

Or, as an alternative, with the stamp and other markings required by the National Board of Boiler and Pressure Vessel Inspectors? (b)(5)(i)(a)

Does each container have a notation as to whether the container is designed for underground or aboveground installation, or both? (b)(5)(i)(b)

If intended for both underground or aboveground installation, and different style hoods are provided, does the marking indicate the proper hood for each type of installation? (b)(5)(i)(b)

Does the marking contain the name and address of the supplier of the container, or with the trade name of the container? (b)(5)(i)(c)

Does the marking include the water capacity of the container in pounds or gallons? (b)(5)(i)(d)

Does the marking contain the pressure in p.s.i.g. for which the container is designed? (b)(5)(i)(e)

Is there a marking with the wording "This container shall not contain a product having a vapor pressure in excess of – p.s.i.g. at 100°F."? (b)(5)(i)(f)

Does the marking include the tare weight in pounds or other identified unit of weight for containers with a water capacity of 300 pounds or less? (b)(5)(i)(g)

Is the container provided with a marking indicating the maximum level to which the container may be filled with liquid at temperatures between 20°F. and 130°F.? (b)(5)(i)(h)

Exception: Except on containers provided with fixed maximum level indicators or which are filled by weighing.

Are the markings in increments of not more than 20°F.? (b)(5)(i)(h)

Does the marking include the outside surface area in square feet? (b)(5)(i)(i)

Are the markings as required above made on a metal nameplate attached to the container and located in such a manner as to remain visible after the container is installed? (b)(5)(ii)

In areas where LP-Gas and one or more other gases are stored or used in the same area, are the containers adequately marked to identify their content? (b)(5)(iii)

Does such marking comply with the ANSI Z48.1-1954, "Method of Marking Portable Compressed Gas Containers To Identify the Material Contained."? (b)(5)(iii)

Location of Containers and Regulating Equipment. (b)(6)

With the exception of one of the following, are containers located outside of buildings? (b)(6)(i)

Is all first stage regulating equipment, if used, located outside of the buildings? (b)(6)(i)

In buildings used exclusively for container charging, vaporization pressure reduction, gas mixing, gas manufacturing or distribution? (b)(6)(i)(a)

When portable use is necessary are the requirements of items contained in paragraph 1910.110(c)(5) met? (b)(6)(i)(b)

LP-Gas fueled stationary or portable engines that are in accordance with the items contained in paragraph 1910.110(e)(11) or (12) of this checklist? (b)(6)(i)(c)

LP-Gas fueled industrial trucks that are used in accordance with paragraph 1910.110(e)(13) of this checklist? (b)(6)(i)(d)

LP-Gas fueled vehicles garaged in accordance with paragraph 1910.110(e)(14) of this checklist? (b)(6)(i)(e)

Containers that are awaiting use or resale when stored in accordance with paragraph 1910.110(f) and the items of this checklist in that same section? (b)(6)(i)(f)

Is Table H-23 (see Appendix) used for the location of individual containers with respect to the nearest important building or group of buildings? (b)(6)(ii)

Are containers that are installed for use prohibited from being stacked one above the other? (b)(6)(iii)

Is readily ignitable material removed within 10 feet of any container? (b)(6)(vi)

Is there at least 20 feet of distance separating liquefied petroleum gas containers and flammable liquid tanks? (b)(6)(vii)

Is the minimum separation between a container and the centerline of the dike at least 10 feet? (b)(6)(vii)

Exception: The foregoing items **do not** apply when LP-Gas containers of 125 gallons or less capacity are installed adjacent to Class III flammable liquid tanks of 275 gallons or less capacity.

Are suitable means provided to prevent the accumulation of flammable liquids under adjacent liquefied petroleum gas containers? (b)(6)(viii)

When dikes are used with flammable liquid tanks, are precautions taken to insure that no liquefied petroleum gas containers will be located within the diked area? (b)(6)(ix)

Container Valves and Container Accessories. (b)(7)

Do all valves, fittings, and accessories connected directly to the container, including primary shutoff valves, have a rated working pressure of at least 250 p.s.i.g.? (b)(7)(i)

Are such valves, fittings, and accessories of material and design suitable for LP-Gas service? (b)(7)(i)

Is the use of cast iron prohibited for container valves, fittings, and accessories? (b)(7)(i)

Do connections to containers have shutoff valves located as close to the container as practicable? (b)(7)(ii)

Exception: Safety relief connections, liquid level gaging devices, and plugged openings.

Where excess flow valves are required, do they close automatically at the rated flows of vapor or liquid as specified by the manufacturer? (b)(7)(iii)

Do all connections or line including valves, fittings, etc., being protected by an excess flow valve, have a greater capacity than the rated flow of the excess flow valve? (b)(7)(iii)

Where excess flow and back pressure check valves are required by this section, are they located inside of the container or at a point outside where the line enters the container? (b)(7)(vi)

Where the excess flow or back pressure check valves are at a point outside the container, is the installation made in such a manner that any undue strain beyond the excess flow or back pressure check valve will not cause breakage between the container and such valve? (b)(7)(vi)

Are all excess flow valves designed with a bypass not to exceed a No. 60 drill size opening to allow equalization of pressures? (b)(7)(vii)

Are all containers of between 30 gallons and 2,000 gallons water capacity, that are filled on a volumetric basis, and manufactured after December 1, 1963, equipped for filling into the vapor space? (b)(7)(viii)

Piping – Including Pipe, Tubing, and Fittings. (b)(8)

Is all pipe made of wrought iron or steel (black or galvanized), brass, copper, or aluminum alloy? (b)(8)(i)

If aluminum alloy pipe is used, is it at least Schedule 40 in accordance with the specifications for Aluminum Alloy Pipe, ANSI Standard H38.-7-1969? (b)(8)(i)

Is the use of alloy No. 5456 prohibited for piping purposes? (b)(8)(i)

Is aluminum alloy pipe protected against external corrosion when it is in contact with dissimilar metals other than galvanized steel, or where its location is subject to repeated wetting by such liquids as water, detergents, sewage, or leaking from other piping, where it passes through flooring, plaster, masonry, or insulation? (b)(8)(i)

Does all aluminum piping have a nominal pipe size of less than three-fourths of an inch? (b)(8)(i)

Where aluminum piping is used are pressures exceeding 20 p.s.i.g. prohibited? (b)(8)(i)

Is the installation of aluminum pipe prohibited within 6 inches of the ground? (b)(8)(i)

Does vapor piping that operates with pressures not exceeding 125 p.s.i.g. have a suitability for a working pressure of at least 125 p.s.i.g.? (b)(8)(i)(a)

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

(b) Basic Rules.

	YES	NO
Does such pipe comply with at least Schedule 40 (ASTM A-53-69), Grade B Electric Resistance Welded and Electric Flash Welded Pipe or Equal? **(b)(8)(i)(a)**		
Is vapor piping used with operating pressures over 125 p.s.i.g., and all liquid piping, suitable for a working pressure of at least 250 p.s.i.g.? **(b)(8)(i)(b)**		
Is such vapor piping at least Schedule 80 if the joints are threaded or threaded and back welded? **(b)(8)(i)(b)**		
Is vapor piping of at least Schedule 40 used if joints are welded or welded and flanged? **(b)(8)(i)(b)**		
Is tubing of seamless manufacture and of copper, brass, steel, or aluminum alloy? **(b)(8)(ii)**		
Is copper tubing of a type K or L or equivalent for Seamless Copper Water Tube, ANSI H23.1-1970? **(b)(8)(ii)**		
Is Table H-24 (see Appendix) used in determining the minimum nominal wall thickness of copper tubing? **(b)(8)(ii)**		
Is aluminum alloy tubing of a Type A or B or equivalent as covered in Specification ASTM B210-68? **(b)(8)(ii)**		
Is such aluminum alloy tubing suitably marked every 18 inches indicating compliance with ASTM Specifications? **(b)(8)(ii)**		
Is Table H-25 (see Appendix) used in determining the wall thickness of aluminum alloy tubing? **(b)(8)(ii)**		
Is aluminum alloy tubing protected against external corrosion when it is in contact with dissimilar metals other than galvanized steel? **(b)(8)(ii)**		
Where aluminum alloy tubing is subject to repeated wetting by liquids such as water, detergents, sewage, or leakage from other piping, or where it passes through flooring, plaster, masonry, or insulation, is it suitably protected? **(b)(8)(ii)**		
Does the aluminum tubing have a maximum outside diameter of three-fourths inch, and are precautions taken to insure that it is not used for pressures exceeding 20 p.s.i.g.? **(b)(8)(ii)**		
Are precautions taken to insure that aluminum alloy tubing will not be installed within 6 inches of the ground? **(b)(8)(ii)**		
Is only heavy walled seamless brass or copper tubing used in systems where the gas in liquid form without pressure reduction enters the building? **(b)(8)(iii)**		
Does such heavy walled seamless brass or copper tubing have an internal diameter of not more than three thirty-seconds inch, and a wall thickness of at least three sixty-fourths inch? **(b)(8)(iii)**		
Is a material having a melting point exceeding 1,000°F. used when pipe joints are screwed, flanged, welded, soldered, or brazed? **(b)(8)(iv)**		
Are joints on seamless copper, brass, steel, or aluminum alloy gas tubing made by means of approved gas tubing fittings, or are they soldered or brazed with a material having a melting point exceeding 1,000°F.? **(b)(8)(iv)**		
Are all fittings for operating pressures of 125 p.s.i.g. or less designed for a pressure of at least 125 p.s.i.g.? **(b)(8)(v)**		
Are all fittings used for operating pressures above 125 p.s.i.g. designed for a minimum of 250 p.s.i.g.? **(b)(8)(v)**		

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

(b) Basic Rules.

	YES	NO
Is the use of threaded cast iron pipe fittings prohibited? **(b)(8)(vi)**		
Are aluminum alloy fittings used with aluminum alloy pipe and tubing? **(b)(8)(vi)**		
Are insulated fittings used where aluminum alloy pipe or tubing connects with a dissimilar metal? **(b)(8)(vi)**		
Are all materials such as valve seats, packing, gaskets, diaphragms, etc., of such quality as to be resistant to the action of liquefied petroleum gas under the service conditions to which they are subjected? **(b)(8)(viii)**		
Is all piping, tubing, or hose tested after assembly and proven free from leaks at not less than normal operating pressures? **(b)(8)(ix)**		
After installations, are piping and tubing systems tested and proved free of leaks using a manometer or equivalent device that will indicate a drop in pressure? **(b)(8)(ix)**		
Are flame tests prohibited? **(b)(8)(ix)**		
Are provisions made to compensate for expansion, contraction, jarring, and vibration, and for settling? **(b)(8)(x)**		
Is all piping that is outside of buildings, whether it is buried or aboveground, supported and protected against physical damage? **(b)(8)(xi)**		
Where soil conditions warrant, is all piping protected against corrosion? **(b)(8)(xi)**		
Where condensation may occur, is the piping pitched back to the container, or are suitable means provided for revaporization of the condensate? **(b)(8)(xi)**		
Hose Specifications. **(b)(9)**		
Is all hose fabricated of materials that are resistant to the action of LP-Gas in the liquid and vapor phases? **(b)(9)(i)**		
If wire braid is used for reinforcing the hose, is it of corrosion-resistant material such as stainless steel? **(b)(9)(i)**		
Is all hose subject to container pressure marked "LP-Gas" or "LPG" at not greater than 10-foot intervals? **(b)(9)(ii)**		
Is all hose subject to container pressure designed for a bursting pressure of not less than 1,250 p.s.i.g.? **(b)(9)(iii)**		
Does all hose subject to container pressure have its correctness as to design construction and performance determined by Underwriters Laboratories, Inc., or Factory Mutual Engineering Corporation? **(b)(9)(iv)**		
Are all hose connections subject to container pressure capable of withstanding, without leakage, a test pressure of not less than 500 p.s.i.g.? **(b)(9)(v)**		
Is all hose and hose connections on the low-pressure side of the regulator or reducing valve designed for a bursting pressure of not less than 125 p.s.i.g. or five times the set pressure of the relief devices protecting that portion of the system, whichever is higher? **(b)(9)(vi)**		
Where hose is used on the low-pressure side of regulators to connect to other than domestic and commercial gas appliances, are the following conditions met? **(b)(9)(vii)**		
Is the appliance portable and does it need a flexible connection? **(b)(9)(vii)(a)**		
When appliances are used inside of buildings is the hose length limited to 6 feet? **(b)(9)(vii)(b)**		

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

(b) Basic Rules.

When appliances are used inside of buildings are precautions taken to insure that the hose will not extend from one room to another? **(b)(9)(vii)(b)**

When appliances are used inside of buildings are precautions taken to insure that hoses will not pass through any walls, partitions, ceilings, or floors? **(b)(9)(vii)(b)**

Are precautions taken to insure that the hose will not be concealed from view or used in a concealed location? **(b)(9)(vii)(b)**

When appliances are used outside of buildings, whose length may exceed this length, are they kept as short as practical? **(b)(9)(vii)(b)**

Are all hoses used on appliances approved, and are they prohibited from being used where they are likely to be subject to temperatures above 125°F? **(b)(9)(vii)(c)**

Is the hose securely connected to the appliance? **(b)(9)(vii)(c)**

Is the shutoff valve for appliances connected by hose in the metal pipe or tubing, and not at the appliance end of the hose? **(b)(9)(vii)(d)**

When shutoff valves are installed close to each other are precautions taken to prevent operation of the wrong valve? **(b)(9)(vii)(d)**

Are hoses used for connecting to wall outlets protected from physical damage? **(b)(9)(vii)(e)**

Safety Devices. **(b)(10)**

Is every container provided with one or more safety relief valves of spring-loaded or equivalent type? **(b)(10)(i)**

Exception: Containers that are constructed in accordance with DOT specifications.

Is every vaporizer provided with one or more safety relief valves of spring-loaded or equivalent type? **(b)(10)(i)**

Exception: Motor fuel vaporizers and vaporizers of less than 1 quart capacity heated by ground or surrounding air, provided that adequate tests demonstrate that the assembly is safe without a safety relief valve.

Are these valves so arranged to afford free vent to the outer air with discharge not less than 5 feet horizontally away from any opening into the building which is below such discharge? **(b)(10)(i)**

Is the rate of discharge in accordance with the listing under the next item in this checklist for containers, and item (iii) in this checklist for vaporizers? **(b)(10)(i)**

Is the chart on "Storage of Liquefied Petroleum" in the Self Inspection Appendix used to determine the minimum required rate of discharge for safety relief valves? **(b)(10)(ii)**

Exception: When containers are constructed with DOT specifications.

Are items *(a)* and *(b)* from 1910.110(b)(10)(iii), which are reproduced below, used for the determination for setting the minimum required rate of discharge for safety relief valves on vaporizers?

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

(b) Basic Rules.

(a) Obtain the total surface area by adding the surface area of vaporizer shell in square feet directly in contact with LP-Gas and the heat exchanged surface area in square feet directly in contact with LP-Gas.
(b) Obtain the minimum required rate of discharge in cubic feet of air per minute at 60°F. and 14.7 p.s.i.a. from subdivision (ii) of this subparagraph, for this total surface area. **(b)(10)(iii)**

Is Table H-26 (see Appendix) used to determine the setting of safety relief valves with relation to the design pressure of the container? **(b)(10)(iv)**

Are safety relief devices with systems employing containers so constructed as to discharge at not less than the rate in the specifications under 1910.110(b)(10)(ii), before the pressure is in excess of 120 percent of the "maximum start to discharge pressure" of the device? **(b)(10)(v)**

In locations where sustained high temperatures prevail that require the use of a lower vapor pressure product to be stored or the use of a higher designed pressure vessel to be used to prevent safety valves opening as the result of the high temperature, are tanks protected by cooling devices such as spraying, by shading, or other effective means? **(b)(10)(vi)**

Are safety relief valves so arranged so that the possibility of tampering will be minimized? **(b)(10)(vii)**

Where the pressure setting on valves is external, are the relief valves provided with approved means for sealing the adjustment? **(b)(10)(vii)**

Are shutoff valves prohibited from being installed between the safety relief devices and the container, or the equipment or piping to which the safety relief device is connected? **(b)(10)(viii)**

Do safety relief valves have a direct communication with the vapor space of the container at all times? **(b)(10)(ix)**

Is each container safety relief valve used with systems covered by 1910.110(d), (e), (g), and (h) plainly and permanently marked so as to identify the container for which it is designed, the pressure in p.s.i.g. at which the valve is set to discharge, and the actual rate of discharge of the valve in cubic feet per minute of air at 60°F. and 14.7 p.s.i.a. and the manufacturer's name and catalog number? **(b)(10)(x)**

Are safety relief valve assemblies of sufficient size so as to provide the rate of flow required for the container on which they are installed? **(b)(10)(xi)**

Is there a hydrostatic relief valve installed between each pair of shutoff valves on LPG liquid piping so as to relieve into a safe atmosphere? **(b)(10)(xii)**

Is the "start-to-discharge pressure" setting of such relief valves not in excess of 500 p.s.i.g.? **(b)(10)(xii)**

Is the minimum setting on relief valves installed in piping connected to other than DOT containers not lower than 140 percent of the container relief valve setting? **(b)(10)(xii)**

Is the minimum setting on relief valves installed in piping connected to DOT containers not lower than 400 p.s.i.g.? **(b)(10)(xii)**

Is the "start-to-discharge pressure" setting of the valve greater than the maximum pressure permitted by the recirculation device in the system? (b)(10)(xii)

Is the discharge from any safety relief device prohibited from terminating in or beneath any building? (b)(10)(xiii)

Exception: Relief devices covered by 1910.110(b)(6)(i) (a) – (e) and 1910.110(c)(4)(i) or (5).

Are container safety relief devices and regulator relief vents located not less than 5 feet in any direction from air openings into sealed combustion system appliances or mechanical ventilation air intakes? (b)(10)(xiv)

Vaporizer and Housing. (b)(11)

Are indirect fired vaporizers utilizing steam, water or other heating medium constructed and installed in accordance with the following requirements: (b)(11)(i)

Are vaporizers constructed in accordance with the requirements of 1910.110(b)(3)(i) – (iii), the items of which are reproduced at this time:

1910.110(b)(3)(i): Are containers used with the following listed systems designed, constructed, and tested in accordance with the Rules for Construction of Unfired Pressure Vessels, Section VIII, Division 1, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 1968:

(1) Systems using other than Department of Transportation.
(2) Liquid petroleum gas as a motor fuel.
(3) Liquid petroleum gas systems installed in commercial vehicles.
(4) Liquid petroleum gas service stations. (b)(11)(i)(a)

Exceptions to the above are contained in 1910.110(e)(3)(iii) and 1910.110(g)(2)(i).

1910.110(b)(3)(ii): NOTE: Containers constructed according to the 1949 and earlier editions of the ASME Code **do not** have to comply with paragraphs U-2 through U-10 and U-19 of that Code.
Is the use of containers constructed according to paragraph U-70 in the 1949 and earlier editions of the ASME Codes prohibited from being used? (b)(11)(i)(a)

1910.110(b)(3)(iii): Containers designed, constructed, and tested prior to July 1, 1961, according to the Code for Unfired Pressure Vessels for Petroleum Liquids and Gases, 1951 edition with 1954 Addenda, of the American Petroleum Institute and the American Society of Mechanical Engineers shall be considered in conformance. Containers constructed according to API-ASME Code **do not** have to comply with section I or with appendix to section I. Paragraphs W-601 to W-606 inclusive in the 1943 and earlier editions **do not** apply. (b)(11)(i)(a)

Are vaporizers permanently marked as follows:

(1) With the code marking signifying the specifications to which the vaporizer is constructed?
(2) With the allowable working pressure and temperature for which the vaporizer is designed?
(3) With the sum of the outside surface area and the inside heat exchange surface area expressed in square feet?
(4) With the name or symbol of the manufacturer? (b)(11)(i)(a)

Do vaporizers having an inside diameter of 6 inches or less exempted by the ASME Unfired Pressure Vessel Code, have a design pressure not less than 250 p.s.i.g.? (b)(11)(i)(b)

Are heating or cooling coils prohibited from being installed inside a storage container? (b)(11)(i)(c)

Are the structures in which vaporizers are installed inside constructed of light, noncombustible material or equivalent? (b)(11)(i)(d)

Is the area well ventilated near the floor line and roof? (b)(11)(i)(d)

When vaporizing and/or mixing equipment is located in a structure or building, is such structure or room separated from the remainder of the building by a wall designed to withstand a static pressure of at least 100 pounds per square foot? (b)(11)(i)(d)

NOTE: This **does not** apply if the building is used exclusively for gas manufacturing or distribution.

Is this wall of a solid type with no openings or pipe or conduit passing through it? (b)(11)(i)(d)

Is such structure or room provided with adequate ventilation? (b)(11)(i)(d)

Is the roof or at least one exterior wall of lightweight construction? (b)(11)(i)(d)

Are vaporizers provided with a safety relief valve that provides an effective rate of discharge in accordance with items under 1910.110(b)(10)(ii) of this checklist?* (b)(11)(i)(e)

Are the heating medium lines into and leaving the vaporizer provided with suitable means for preventing the flow of gas into the heat systems in the event of tube rupture in the vaporizer? (b)(11)(i)(f)

Are vaporizers provided with suitable automatic means to prevent liquid passing through the vaporizer to the gas discharge piping? (b)(11)(i)(f)

Is the device that supplies the necessary heat for producing steam, hot water, or other heating medium that is located in a building, compartment, room, or lean-to have such compartment ventilated near the floorline and roof to the outside? (b)(11)(i)(g)

Is the heating device location separated from all compartments or rooms containing liquefied petroleum gas vaporizers, pumps, and central gas mixing devices by a wall designed to withstand a static pressure of at least 100 pounds per square foot? (b)(11)(i)(g)

Is this wall of a solid type with no openings or pipe or conduits passing through it? (b)(11)(i)(g)

Are gas-fired heating systems equipped with automatic safety devices to shut off the flow of gas to main burners, if the pilot light should fail? (b)(11)(i)(h)

Are precautions taken to insure that vaporizers are not equipped with fusible plugs? (b)(11)(i)(j)

Are precautions taken to insure that vaporizer houses do not have unprotected drains to sewers or sump pits? (b)(11)(i)(k)

*See Self Inspection Appendix

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

(b) Basic Rules.

	YES	NO

Are atmospheric vaporizers employing heat from the ground or surrounding air installed as follows:

(a) Are they buried underground, or
(b) Are they located inside the building close to a point at which the pipe enters the building, provided the capacity of the unit does not exceed 1 quart?
(c) If the vaporizers are of less than 1 quart capacity, have precautions been taken to insure that adequate tests that the assembly is safe without a safety relief valve? **(b)(11)(ii)**

Are direct gas-fired vaporizers constructed, marked, and installed as follows: **(b)(11)(iii)**

(1) In accordance with the requirements of the ASME Boiler and Pressure Vessel Code-1968?
(2) With the name of the manufacturer; the rated BTU input to the burner; the area of the heat exchange surface in square feet; the outside surface of the vaporizer in square feet; and the maximum vaporizing capacity in gallons per hour? **(b)(11)(iii)(a)**

(1) Where vaporizers are connected to the liquid section or the gas section of the storage container, or both, is there at the container a manually operated valve in each connection to permit completely shutting off all flow of gas or liquid from container to vaporizer?
(2) Are vaporizers with capacity not exceeding 35 gallons per hour located at least 5 feet from container shutoff valves?
Are vaporizers having a capacity of more than 35 gallons, but not exceeding 100 gallons per hour located at least 10 feet from the container shutoff valves?
Are vaporizers having a capacity greater than 100 gallons per hour located at least 15 feet from the container shutoff valves? **(b)(11)(iii)(b)**

Where vaporizers are installed in buildings, rooms, housings, sheds, or lean-tos used exclusively for vaporizing or mixing of LPG, are such structures of noncombustible construction? **(b)(11)(iii)(c)**

Are such structures well ventilated near the floorline and the highest point of the roof? **(b)(11)(iii)(c)**

When vaporizer and/or mixing equipment is located in a structure or room attached to or within a building, is such structure or room separated from the remainder of the building by a wall designed to withstand a static pressure of at least 100 pounds per square foot? **(b)(11)(iii)(c)**

Is such wall solid with no openings or pipe or conduit passing through it? **(b)(11)(iii)(c)**

Is such structure or room provided with adequate ventilation, and does it have a roof of at least one exterior wall of lightweight construction? **(b)(11)(iii)(c)**

Do vaporizers have at or near the discharge, a safety relief valve providing an effective rate of discharge in accordance with the items contained in 1910.110(b)(10)(ii) of this checklist?* **(b)(11)(iii)(d)**

Is this relief valve so located as not to be subjected to temperatures in excess of 140°F.? **(b)(11)(iii)(d)**

Are vaporizers provided with suitable automatic means to prevent liquid passing from the vaporizer to the gas discharge piping of the vaporizer? **(b)(11)(iii)(e)**

Are vaporizers provided with means for manually turning off the gas to the main burner and pilot? **(b)(11)(iii)(f)**

*See Self Inspection Appendix

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

(b) Basic Rules.

	YES	NO

Are vaporizers equipped with automatic safety devices to shut off the flow of gas to main burners if the pilot light should fail? **(b)(11)(iii)(g)**

When the flow through the pilot exceeds 2,000 BTU per hour, is the pilot equipped with an automatic safety device to shut off the flow of gas to the pilot should the pilot flame be extinguished? **(b)(11)(iii)(g)**

Where pressure regulating and pressure reducing equipment is located within 10 feet of a direct fired vaporizer, is it separated from the open flame by a substantially airtight noncombustible partition or partitions? **(b)(11)(iii)(h)**

Are the following minimum distances maintained between direct fired vaporizers and the nearest important building or group of buildings:

Ten feet for vaporizers having a capacity of 15 gallons per hour or less vaporizing capacity;
Twenty-five feet for vaporizers having a vaporizing capacity of 16 to 100 gallons per hour;
Fifty feet for vaporizers having a vaporizing capacity exceeding 100 gallons per hour? **(b)(11)(iii)(i)**

Are precautions taken to insure that direct fired vaporizers will not raise the product pressure above the design pressure of the vaporizer equipment? **(b)(11)(iii)(j)**

Are precautions taken to insure that direct fired vaporizers will not raise the product pressure within the storage container above the pressure shown in the second column of Table H-31? (See Appendix.) **(b)(11)(iii)(j)**

Are fusible plugs prohibited from being installed in vaporizers? **(b)(11)(iii)(k)**

Are precautions taken to insure that vaporizers will not have unprotected drains to sewers or sump pits? **(b)(11)(iii)(l)**

Are direct gas-fired tank heaters constructed and installed as follows:

(a) Are direct gas-fired tank heaters, and tanks to which they are applied, installed only aboveground?
(b) Are tank heaters permanently marked with the name of the manufacturer, the rated BTU input to the burner, and the maximum vaporizing capacity in gallons per hour?
(c) Are tank heaters an integral part of a fuel storage container directly connected to the container liquid section, or vapor section, or both?
(d) Are tank heaters provided with a means for manually turning off the gas to the main burner and pilot?
(e) Are tank heaters equipped with an automatic safety device to shut off the flow of gas to main burners, if the pilot light should fail?
When flow through pilot exceeds 2,000 BTU per hour, is the pilot equipped with an automatic safety device to shut off the flow of gas to the pilot should the pilot flame be extinguished?
(f) Where pressure regulating and pressure reducing equipment is located within 10 feet of a direct fired tank heater, is it separated from the open flame by a substantially airtight noncombustible partition?

(g) Are the following minimum distances maintained between a storage tank heated by a direct fired tank heater and the nearest important building or group of buildings:

Ten feet for storage containers of less than 500 gallons water capacity;

Twenty-five feet for storage containers of 500 to 1,000 gallons water capacity;

Fifty feet for storage containers of over 1,200 gallons water capacity?

(h) Are precautions taken to insure that no direct fired tank heater can raise the product pressure within the storage container over 75 percent of the pressure set out in the second column of Table H-31? (See Appendix.) **(b)(11)(iv)**

Is the vaporizer section of vaporizer-burners used for dehydrators or dryers located outside of buildings? **(b)(11)(v)**

Are they constructed and installed in accordance with the following items?

(a) Do vaporizer-burners have a minimum design pressure of 250 p.s.i.g. with a safety factor of five?

(b) Are manually operated positive shutoff valves located at the containers to shut off all flow to the vaporizer-burners?

(c) Are the following minimum distances between storage containers and vaporizer-burners maintained:

Ten feet for storage containers of less than 500 gallons capacity;

Twenty-five feet for containers of 501 gallons to 2,000 gallons capacity;

Fifty feet for containers having a capacity of over 2,000 gallons?

(d) Is the vaporizer section of vaporizer-burners protected by a hydrostatic relief valve?

Is such relief valve so located so as not to be subjected to temperatures in excess of 140°F.?

Is the "start-to-discharge pressure" setting such as to protect the components involved, but not less than 250 p.s.i.g.?

Is the relief valve discharge directed upward and away from component parts of the equipment, and away from operating personnel?

(e) Are vaporizer-burners provided with means for manually turning off the gas to the main burner and pilot?

(f) Are vaporizer-burners equipped with automatic safety devices to shut off the flow of gas to the main burner and pilot in the event the pilot is extinguished?

(g) Are pressure regulating and control equipment located or protected so that the temperatures surrounding this equipment will not exceed 140°F., unless such equipment components are designed to withstand higher temperatures?

(h) Are pressure regulating and control equipment, which are located downstream of the vaporizer, designed to withstand the maximum discharge temperature of the vapor?

(i) Are fusible plugs prohibited from being installed on the vaporizer section of vaporizer-burners?

(j) Are vaporizer coils or jackets made of ferrous metal or high temperature alloys?

(k) Is equipment utilizing vaporizer-burners equipped with automatic shutoff devices upstream and downstream of the vaporizer section, and so connected as to operate in the event of excessive temperature, flame failure, and, if applicable, insufficient airflow? **(b)(11)(v)**

Filling Densities. **(b)(12)**

Are all containers filled in accordance with the filling densities shown in Table H-27? (See Appendix.) **(b)(12)(i)**

With the exception of item (iii) which follows, are containers, including mobile cargo tanks and portable tank containers regardless of size or construction that are shipped under DOT jurisdiction, or constructed in accordance with 49 CFR Chapter I, charged in accordance with 49 CFR Chapter I requirements? **(b)(12)(ii)**

Are portable containers not subject to DOT jurisdiction filled either by weight, or by volume using a fixed length dip tube gaging device? **(b)(12)(iii)**

LP-Gas in Buildings. **(b)(13)**

Are the following requirements met if vapor is piped into building at pressures in excess of 20 p.s.i.g.:

(a) Are buildings constructed in accordance with this section?

(b) Are buildings used exclusively to house equipment for vaporization, pressure reduction, gas mixing, gas manufacturing, or distribution, or to house internal combustion engines, industrial processes, research and experimental laboratories, or equipment and processes using such gas and having similar hazard?

(c) Are buildings, structures, or equipment under construction or undergoing major renovation? **(b)(13)(i)**

Is liquid permitted only in buildings as follows:

(a) Are buildings, or separate areas of buildings, used exclusively to house equipment for vaporization, pressure reduction, gas mixing, gas manufacturing, or distribution, or to house internal combustion engines, industrial processes, research and experimental laboratories, or equipment and processes using such gas and having similar hazard? And when such buildings, or separate areas are constructed in accordance with this section? **(b)(13)(ii)**

(b) Are buildings, structures, or equipment under construction or undergoing major renovation, provided the temporary piping meets the following conditions:

(1) Does liquid piping inside the building conform to the items under 1910.110(b)(8) of this checklist?

Is the liquid piping inside the building limited to a three-fourths-inch iron pipe size?

Is all such piping protected against construction hazards?

Is liquid piping inside of buildings kept to a minimum?

Is such piping securely fastened to walls or other surfaces so as to provide adequate protection from breakage, and so located as to subject the liquid line to the lowest ambient temperatures?

(2) Is there a shutoff valve installed in each intermediate branch line where it takes off the main line, and is it readily accessible?

Is there a shutoff valve placed at the appliance end of the intermediate branch line?

Is such shutoff valve upstream of any flexible connector used with the appliance?

(3) Are there suitable excess flow valves installed in the container outlet supplying liquid LP-Gas to the building?

Is there a suitable excess flow valve installed immediately downstream of each shutoff valve?

Are suitable excess flow valves installed where piping size is reduced, and are they sized for the reduced size piping?

YES NO

(4) Are hydrostatic relief valves installed in accordance with the items listed under 1910.110(b)(10)(xii) of this checklist?

(5) Is the use of hose to carry liquid between the container and the building or at any point in the liquid line, except at the appliance connector, prohibited?

(6) Where flexible connectors are necessary for appliance installation, are such connectors as short as practicable?

Do such connectors comply with the items under 1910.110(b)(8)(ii) or (9) in this checklist?

(7) Is the release of fuel when any section of piping or appliance is disconnected minimized by either of the following methods:

(i) Use of an approved automatic quick-closing coupling; or

(ii) Closing the valve nearest to the appliance and allowing the appliance to operate until the fuel in the line is consumed;

(iii) Are portable containers prohibited from being taken into buildings, except when the items under 1910.110(b)(6)(i) of this checklist are complied with? **(b)(13)(ii)**

Transfer of Liquids. **(b)(14)**

Are the following precautions taken when transferring liquids: **(b)(14)(i)**

Is one attendant required to remain close to the transfer connection from the time the connections are first made until they are finally disconnected, during the transfer of the product? **(b)(14)(i)**

Are containers filled or used only upon authorization of the owner? **(b)(14)(ii)**

Are "single trip" or "nonrefillable" containers prohibited from being refilled or reused in LP-Gas service? **(b)(14)(iii)**

Are precautions taken to insure that gas or liquid will not be vented to the atmosphere to assist in transferring contents of one container to another? **(b)(14)(iv)**

Exception: As provided in paragraph 1910.110(e)(5)(iv) which follows the normal sequence in this checklist.

This **does not** preclude the use of listed pump utilizing LP-Gas in the vapor phase as a source of energy and venting such gas to the atmosphere at a rate not to exceed that from a No. 31 drill size opening, and provided that such venting and liquid transfer is located not less than 50 feet from the nearest important building. **(b)(14)(iv)**

Are precautions taken to insure that the filling of fuel containers for industrial trucks or motor vehicles from industrial bulk storage containers is performed not less than 10 feet from the nearest important masonry-walled building, and not less than 25 feet from the nearest important building or other construction, but, in any event, not less than 25 feet from any building opening? **(b)(14)(v)**

Are precautions taken to insure that the filling of portable containers, containers mounted on skids, fuel containers on farm tractors, or similar applications from storage containers used in domestic or commercial service, are performed not less than 50 feet from the nearest important building? **(b)(14)(vi)**

YES

Are precautions taken to insure that the filling connection and the vent from the liquid level gages in containers, filled at the point of installation, are not less than 10 feet in any direction from air openings into sealed combustion system appliances or mechanical ventilation air intakes? **(b)(14)(vii)**

Are fuel supply containers gaged and charged only in the open air, or in buildings especially provided for that purpose? **(b)(14)(viii)**

Is Table H-31 and Table H-32 (see Appendix) used to determine the maximum vapor pressure of the product at 100°F., which may be transferred into a container, listed in those tables? **(b)(14)(ix)**

Are DOT requirements used for DOT containers in determining the maximum vapor pressure of the product at 100°F. which may be transferred into a container? **(b)(14)(ix)**

Are precautions taken to assure that only those gases for which the system is designed, examined, and listed, are employed in its operation, particularly with regard to pressures? **(b)(14)(x)**

Are pumps or compressors designed for use with LP-Gas? **(b)(14)(xi)**

When compressors are used, do they normally take suction from the vapor space of the container being filled and discharge to the vapor space of the container being emptied? **(b)(14)(xi)**

Do pumping systems, when equipped with a positive displacement pump, include a recirculating device which will limit the differential pressure on the pump under normal operating conditions to the maximum differential pressure rating of the pump? **(b)(14)(xii)**

Is the discharge of the pumping system protected so that the pressure does not exceed 350 p.s.i.g.? **(b)(14)(xii)**

If a recirculation system discharges into the supply tank and contains a manual shutoff valve, is there an adequate secondary safety recirculation system incorporated? **(b)(14)(xii)**

Are precautions taken to assure that this safety recirculation system will not have means of rendering it inoperative? **(b)(14)(xii)**

Are manual shutoff valves in recirculation kept open except during an emergency or when repairs are being made to the system? **(b)(14)(xiii)**

Where necessary, are unloading piping or hoses provided with suitable bleeder valves for relieving pressure before disconnection? **(b)(14)(xiii)**

Is agricultural air moving equipment, including crop dryers, shut down when supply containers are being filled, unless the air intakes and sources of ignition on the equipment are located 50 feet or more from the container? **(b)(14)(xiv)**

Is agricultural equipment employing open flames or equipment with integral containers, such as flame cultivators, weed burners, shut down during refueling? **(b)(14)(xv)**

Tank Car or Transport Truck Loading or Unloading Points and Operations. **(b)(15)**

Is the track of the tank car siding relatively level? **(b)(15)(i)**

	YES	NO
Is a sign reading "Tank Car Connected" installed at the active end or ends of the siding while the tank car is connected? **(b)(15)(ii)**		
While cars are on a sidetrack for loading or unloading, are the wheels at both ends blocked on the rails? **(b)(15)(iii)**		
Are precautions taken to insure that an employee is in attendance at all times while the tank car, cars, or trucks are being loaded or unloaded? **(b)(15)(iv)**		
Is there a backflow check valve, excess flow valve, or a shutoff valve with means of remote closing installed close to the point where the liquid piping and hose or swing joint pipe is connected? **(b)(15)(v)**		
Is the shutoff valve provided with means of remote closing? **(b)(15)(v)**		
When the size of the loading or unloading hoses and/or piping is reduced below the size of the tank car or transport truck loading or unloading connections, are the adaptors to which lines are attached equipped with either a backflow check valve, a properly sized excess flow valve, or shutoff valve with means of remote closing? **(b)(15)(vi)** **Exception:** This **does not** apply if the tank car or transport is equipped with a quick-closing internal valve that can be remotely closed.		
Are the following considerations given to the location of the tank car or transport truck loading or unloading points?		
(a) Proximity to railroads and highway traffic;		
(c) With respect to buildings on installer's property;		
(d) Nature of occupancy;		
(e) Topography;		
(f) Type of construction of buildings;		
(g) Number of tank cars or transport trucks that may be safely loaded or unloaded at one time;		
(h) Frequency of loading or unloading? **(b)(15)(viii)**		
Is Table H-23 (see Appendix) used to determine the location of tank car or truck loading or unloading points? **(b)(15)(ix)**		
Instructions. **(b)(16)** Are employees performing installation, removal, operation, and maintenance work properly trained in such functions? **(b)(16)**		
Electrical Equipment and Other Sources of Ignition. **(b)(17)** Is electrical equipment and wiring of such a type as specified and installed in accordance with subpart S for ordinary locations? **(b)(17)(i)**		
Where fixed electrical equipment is installed in classified areas as determined in Table H-28 (see Appendix), does it conform to the applicable provisions of the National Electrical Code, Class I, Group D? **(b)(17)(i)**		
Are open flames or other sources of ignition prohibited in vaporizer rooms, pumphouses, container charging rooms or other similar locations? **(b)(17)(ii)**		
Are direct-fired vaporizers prohibited from being installed in pumphouses or container charging rooms? **(b)(17)(ii)**		

	YES	NO
Are open flames, cutting or welding, portable electric tools, and extension lights capable of igniting LP-Gas, prohibited within classified areas, as specified in Table H-28? (See Appendix.) **(b)(17)(iii)** **Exceptions:** As provided in subparagraph 1910.110 (b)(11), and unless the LP-Gas facilities have been freed of all liquid and vapor, or special precautions observed under carefully controlled conditions.		
Fixed Electrical Equipment in Classified Areas. **(b)(18)** Is Table H-28 (see Appendix) used to determine the classified areas, and is all fixed electrical equipment and wiring installed therein in accordance with that table and appropriate provisions of the items under subpart S of this part? **(b)(18)**		
Liquid-Level Gaging Device. **(b)(19)** Is each container that was manufactured after December 31, 1965, and filled on a volumetric basis equipped with a fixed liquid-level gage to indicate the maximum permitted filling level as provided in item (v) below? **(b)(19)(i)**		
Does each container manufactured after December 31, 1969 have permanently attached to the container, adjacent to the fixed level gage, a marking showing the percentage full that will be shown by that gage? **(b)(19)(i)**		
When a variable liquid-level gage is also provided, does it also serve as a means for checking the variable gage? **(b)(19)(i)**		
Are these gages used in charging containers as required in the items contained in 1910.110(b)(12) of this checklist? **(b)(19)(i)**		
Are all variable gaging devices arranged so that the maximum liquid level to which the container may be charged is readily determinable? **(b)(19)(ii)**		
Are the markings indicating the various liquid levels from empty to full shown on the system nameplate or gaging device? **(b)(19)(ii)**		
As an alternative to the item immediately above, a part of the markings may be on the system nameplate and a part on the gaging device. **(b)(19)(ii)**		
Do dials of magnetic or rotary gages show whether they are for cylindrical or spherical containers? **(b)(19)(ii)**		
Do dials of magnetic or rotary gages show whether they are for aboveground or underground service? **(b)(19)(ii)**		
Are the dials of gages intended for use only on aboveground containers of over 1,200 gallons capacity so marked? **(b)(19)(ii)**		
Are gaging devices that require bleeding of the product to the atmosphere, designed so that the bleed valve maximum opening is not larger than a No. 54 drill size, unless provided with excess flow valve? **(b)(19)(iii)**		
Does each gaging device have a design working pressure of at least 250 p.s.i.g.? **(b)(19)(iv)**		
Is each length of tube or position of fixed liquid-level gage designed to indicate the maximum level to which the container may be filled for the product contained? **(b)(19)(v)**		
Is this level based on the volume of the product at 40°F. at its maximum permitted filling density for aboveground containers, and at 50°F. for underground containers? **(b)(19)(v)**		

Has the employer calculated the filling point for which the fixed liquid level gage shall be designed according to the methods in this subdivision, and as found in the various formulas under 1910.110(b)(19)(v)(a-d)?* (b)(19)(v)

Are fixed liquid-level gages that are used on containers other than DOT containers stamped on the exterior of the gage with the letters "DT" followed by the vertical distance (expressed in inches and carried out to one decimal place) from the top of the container to the end of the dip tube, or to the centerline of the gage when it is located at the maximum permitted filling level? (b)(19)(vi)

For portable containers that may be filled in the horizontal and/or vertical position, are the letters "DT" followed by "V" with the vertical distance from the top of the container to the end of the dip tube for vertical filling, and with "H" followed by the proper distance for horizontal filling? (b)(19)(vi)

For DOT containers is the stamping placed both on the exterior of the gage and on the container? (b)(19)(vi)

On aboveground or cargo containers where the gages are positioned at specific levels, and where the marking may be specified in percent of total tank contents, is the marking stamped on the container? (b)(19)(vi)

Is the use of gage glasses of the columnar type restricted to charging plants where the fuel is withdrawn in the liquid phase only? (b)(19)(vii)

Are such gage glasses equipped with valves having metallic handwheels, with excess flow valves, and with extra-heavy glass adequately protected with a metal housing applied by the gage manufacturer? (b)(19)(vii)

Are such gage glasses shielded against the direct rays of the sun? (b)(19)(vii)

Are such gage glasses prohibited on tank trucks, and on motor fuel tanks, and on containers used in domestic, commercial, and industrial installations? (b)(19)(vii)

Are gaging devices of the float, or equivalent type which are not required to be equipped with excess flow valves provided with piping and fittings that are adequately designed to withstand the container pressure, and are properly protected against physical damage and breakage? (b)(19)(vii)

Requirements For Appliances. (b)(20)

With the exception as provided in item (ii) below, are all new commercial and industrial gas consuming appliances approved? (b)(20)(i)

Where an appliance that was originally manufactured for operation with a gaseous fuel other than LP-Gas is used for LPG, has it been properly converted, adapted, and tested for performance with LPG before the appliance is placed in use? (b)(20)(ii)

Are unattended heaters used inside of buildings for the purpose of animal or poultry production or care equipped with an approved automatic device designed to shut off the flow of gas to the main burners, and pilot if used, in the event of flame extinguishment? (b)(20)(iii)

*See Self Inspection Appendix

Are all commercial, industrial, and agricultural appliances or equipment installed in accordance with the requirements of this section, and especially in accordance with the following:

(a) Do all domestic and commercial appliances comply with NFPA 54-1969?
(b) Do all industrial appliances comply with NFPA 54A-1969?
(c) Where used for stationary combustion engines and gas turbines, do they comply with NFPA 37-1970?
(d) Is NFPA 96-1970 used for the installation of equipment for the removal of smoke and grease-laden vapors from commercial cooking equipment? (b)(20)(iv)

(c) Cylinder Systems.

Application. (c)(1)

The following items apply specifically to systems utilizing containers constructed in accordance with DOT specifications, and all requirements of paragraph (b) of this checklist apply to this paragraph unless otherwise noted in paragraph (b) of this section. (c)(1)

Marking of Containers. (c)(2)

Are containers marked in accordance with DOT regulations? (c)(2)(i)

Except as provided in item (iii) below, is each container marked with its water capacity in pounds, or other identified unit of weight? (c)(2)(ii)

If a container is filled and maintained only by the owner or his representative, is the water capacity of each container identifiable by a code? (c)(2)(iii)

Is each container marked with its tare weight in pounds or other identified unit of weight, including all permanently attached fittings but not the cap? (c)(2)(iv)

Description of a System. (c)(3)

Are precautions taken to insure that a system is defined as one including the container base or bracket, containers, container valves, connectors, manifold valve assembly, regulators and relief valves? (c)(3)

Containers and Regulating Equipment Installed Outside of Buildings or Structures. (c)(4)

Are containers prohibited from being buried below ground? (c)(4)(i)

Are precautions taken to insure that the container and regulating equipment are not in contact with the ground? (c)(4)(i)

Is such compartment or recess drained and ventilated horizontally to the outside air from its lowest level? (c)(4)(i)

Is such ventilation outlet and drainage outlet at least 3 feet away from any building opening which is below the level of such outlet? (c)(4)(i)

Except as specifically provided in paragraph 1910.110(b)(6)(i)(a) through (e), is the discharge from safety relief devices located not less than 3 feet horizontally away from any building opening which is below the level of such discharge? (c)(4)(i)

	YES	NO
Are precautions taken to insure that such discharge from safety relief devices will not terminate beneath any building unless such space is well ventilated to the outside, and is not enclosed on more than two sides? (c)(4)(i)		
Are containers set upon firm foundation or otherwise firmly secured? (c)(4)(ii)		
Is the possible effect on the outlet piping of settling guarded against by a flexible connection or special fitting? (c)(4)(ii)		
Containers and Equipment Used Inside of Buildings or Structures. (c)(5) When operational requirements make portable use of containers necessary and their location outside of buildings or structures impracticable, they may be used inside of buildings or structures only in accordance with items contained in (a) through (l) of this checklist as follows: (c)(5)(i) Containers in use shall mean connected for use? (c)(5)(i)(a)		
Are systems utilizing containers having a water capacity greater than 2½ pounds equipped with excess flow valves? (c)(5)(i)(b)		
Are such excess flow valves either integral with the container valves or in the connections to the container valve outlets? (c)(5)(i)(b)		
In any event, are excess flow valves installed in such a manner that any undue strain beyond the excess flow valve will not cause breakage between the container and the excess flow valve? (c)(5)(i)(b)		
Does the installation of excess flow valves take into account the type of valve protection provided? (c)(5)(i)(b)		
If regulators are used, are they either directly connected to the container valves or to manifolds connected to the container valves? (c)(5)(i)(c)		
Is any regulator used, suitable for use with LP-Gas? (c)(5)(i)(c)		
Are manifolds and fittings connecting containers to the pressure regulator inlets designed for at least 250 p.s.i.g. service pressure? (c)(5)(i)(c)		
Are valves on containers having a water capacity greater than 50 pounds protected while in use? (c)(5)(i)(d)		
Are containers marked in accordance with the items covered in 1910.110(b)(5)(iii) and 1910.110(c)(2) of this checklist? (c)(5)(i)(e)		
Does pipe or tubing conform to 1910.110(b)(8) of this checklist, except that aluminum pipe or tubing is prohibited? (c)(5)(i)(f)		
Is hose designed for a working pressure of at least 250 p.s.i.g.? (c)(5)(i)(g)(1)		
Is all hose and hose connections in accordance with the design, construction and performance determined by Underwriters Laboratories, Inc., or Factory Mutual Engineering Corporation? (c)(5)(i)(g)(1)		
If the hose length is in excess of the length specified in 1910.110(b)(9)(vii)(b), is it as short as practicable? (c)(5)(i)(g)(1)		

	YES	NO
Is the hose in use sufficiently long enough to permit compliance with spacing provisions in 1910.110(c)(5)(v)(c), (e)(2)(vi)(b), and (ix)(b), without causing kinking or straining or causing the hose to be so close to a burner as to damage it by heat? (c)(5)(i)(g)(2)		
Are portable heaters, including salamanders, equipped with an approved automatic device to shut off the flow of gas to the main burner, and pilot if used, in the event of flame extinguishment? (c)(5)(i)(h)		
Are such heaters having inputs above 50,000 BTU manufactured on or after May 17, 1967, and such heaters having inputs above 100,000 BTU manufactured before May 17, 1967, equipped with either: *(1)* A pilot which must be lighted and proved before the main burner can be turned on; or *(2)* An electric ignition system? (c)(5)(i)(h) NOTE: The above two items **do not** apply to tar kettle burners, torches, melting pots, nor do they apply to portable heaters under 7,500 BTU input when used with containers having a maximum water capacity of 2½ pounds.		
Are container valves, connectors, regulators, manifolds, piping, and tubing prohibited from being used as structural supports for heaters? (c)(5)(i)(h)		
Are containers, regulating equipment, manifolds, pipe, tubing, and hose so located as to minimize exposure to abnormally high temperatures, physical damage, or tampering by unauthorized persons? (c)(5)(i)(i)		
Is heat-producing equipment located and used so as to minimize the possibility of ignition or combustibles? (c)(5)(i)(j)		
Where containers having a water capacity greater than 2½ pounds are connected for use, do they stand on a firm and substantially level surface and, when necessary, are they secured in an upright position? (c)(5)(i)(k)		
Are containers being used, including the valve protective devices, installed so as to minimize the probability of impingement of discharge of safety relief devices upon containers? (c)(5)(i)(l)		
Are the following items met when containers are used in buildings or structures that are undergoing construction or major renovation:		
(a) Containers have a maximum water capacity of 245 pounds for each individual container?		
(b) Where heaters are used for temporary heating, are they located at least 6 feet from any LP-Gas container?		
For those containers that are specifically designed for attachment to the heaters, are they designed and installed so as to prevent direct or radiant heat application from the heater onto the container?		
Are precautions taken to insure that blower and radiant type heaters will not be directed toward any LP-Gas container within 20 feet?		
(c) Where two or more heater-container units, of either the integral or non-integral type are located in an unpartitioned area on the same floor, are the containers of each unit separated from the containers of any other unit by at least 20 feet?		

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(c) Cylinder Systems.

YES NO

(d) When heaters are connected to containers for use in an unpartitioned area on the same floor, is the total water capacity of containers manifolded together for connection to a heater or heaters limited to 735 pounds?

Are such manifolds separated by at least 20 feet?

(e) Are the following items complied with when containers are manifolded together for connection to a heater or heaters on another floor:

(1) Where the total water capacity of containers connected to any one manifold is not greater than 2,450 pounds?

(2) Where more than one manifold having a total water capacity greater than 735 pounds are located in the same unpartitioned area, are they at least 50 feet apart?

(f) Are the items under 1910.110(f) of this checklist, which follows in normal sequence, used as a guide in storage of containers awaiting use? (c)(5)(v)

Are the following precautions taken when containers are to be used in industrial occupancies for processing, research, or experimental purposes?

(a) Is the maximum water capacity of individual containers limited to 245 pounds?

(b) Are containers that are connected to a manifold limited to a total water capacity not exceeding 735 pounds?

Are precautions taken to insure that not more than one such manifold may be located in the same room unless separated by at least 20 feet from a similar unit?

(c) Is the amount of LP-Gas in containers for research and experimental use limited to the smallest practical quantity? (c)(5)(vi)

Do containers and heaters comply with the items in 1910.110(c)(5)(v) above when containers are used in industrial occupancies with essentially noncombustible contents, where portable equipment for space heating is essential, and where a permanent heating installation is not practical? (c)(5)(vii)(a)

Are the items contained in 1910.110(c)(5)(v) complied with when containers are used in buildings for temporary emergency heating purposes, when the permanent heating system is temporarily out of service? (c)(5)(viii)

In the above instance, are precautions taken to insure that the temporary heating equipment will not be left unattended? (c)(5)(viii)(b)

Are the following items complied with when containers are used temporarily in buildings for training purposes, that relate to installation and use of LP-Gas systems?

(a) Is the maximum water capacity of individual containers limited to 245 pounds, with the understanding that the maximim quantity of LP-Gas that may be placed in each container shall be no more than 20 pounds?

(b) If more than one such container is located in the same room, are precautions taken to insure that the containers will be separated by at least 20 feet?

Container Valves and Accessories. (c)(6)

In the assembly of multiple container systems, are valves arranged so that replacement of containers can be made without shutting off the flow of gas in the system? (c)(6)(i)

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(c) Cylinder Systems.

YES NO

Are regulators and low-pressure relief devices rigidly attached to the cylinder valves, cylinders, supporting walls, building walls, or otherwise rigidly secured, and are they so installed or protected that the elements will not affect their operation? (c)(6)(ii)

Are the following items complied with to protect container valves and connections while the container is in transit, in storage, and while being moved into the final use position:

(a) Are they set into the recess of the container to prevent the possibility of their being struck if the container is dropped upon a flat surface, or

(b) Provided with a ventilated cap or collar fastened to the container, capable of withstanding a blow from any direction equivalent to that of a 30-pound weight dropped 4 feet?

Are surface caps or collars constructed so that a blow will not be transmitted to the valve or other connection? (c)(6)(iii)

Are precautions taken to insure that when containers are not connected to the system, the outlet valves will be kept tightly closed or plugged, even though the containers are considered empty? (c)(6)(iv)

Are containers recharged at the installation, having a water capacity in excess of 50 pounds, provided with excess flow or backflow check valves? (c)(6)(v)

Safety Devices. (c)(7)

Are containers provided with safety devices as required by DOT regulations? (c)(7)(i)

Is the final stage regulator of an LP-Gas system equipped on the low-pressure side with a relief valve which is set to start to discharge within the limits specified in Table H-30? (See Appendix.) (c)(7)(ii)

When a regulator or pressure relief valve is used inside a building for purposes other than specified in paragraph (b)(6)(i) (a)–(f), is the relief valve and the space above the regulator, and relief valve diaphragms vented to the outside air with the discharge outlet located not less than 3 feet horizontally away from any building opening which is below such discharge? (c)(7)(iii)

NOTE: These provisions **do not** apply to individual appliance regulators when protection is otherwise provided, nor to items covered in 1910.110(c)(5) of this paragraph, and 1910.110(b)(10)(xiii) of this section.

In buildings devoted exclusively to gas distribution purposes, the space above the diaphragm need not be vented to the outside.

Reinstallation of Containers. (c)(8)

Are precautions taken to insure that containers are not reinstalled unless they are requalified in accordance with DOT regulations? (c)(8)

Permissible Product. (c)(9)

Are precautions taken to insure that a product will not be placed in a container marked with a service pressure less than four-fifths of the maximum vapor pressure of the product at 130°F? (c)(9)

YES NO

(d) Systems Utilizing Containers Other Than DOT Containers.

Application. (d)(1)

The following items of this checklist apply specifically to systems utilizing storage containers other than those constructed in accordance with DOT specifications. The items included in this checklist under 1910.110(b) apply to this paragraph, unless specifically noted otherwise in paragraph (b). (d)(1)

Is Table H-31 (see Appendix) used in the design and classification of storage containers? (d)(2)

Container Valves and Accessories, Filler Pipes, and Discharge Pipes. (d)(3)

Is the filling pipe inlet terminal prohibited from being located inside a building? (d)(3)(i)

For containers with a water capacity of 125 gallons or more, are such terminals located not less than 10 feet from any building? (d)(3)(i)

Are such filling pipe terminals located in a protective housing built for that purpose? (d)(3)(i)

Is the filling connection fitted with one of the following:

(a) A combination back-pressure check valve and excess flow valve?

(b) One double or two single back-pressure check valves?

(c) A positive shutoff valve, in conjunction with either:

(1) An internal lock pressure valve, or

(2) An internal excess flow valve? (d)(3)(ii)

Are all openings in a container equipped with approved automatic excess flow valves – with the following exceptions:

(1) Filling connections as provided in subdivision (ii) above;

(2) Safety relief connections, liquid-level gaging devices, as provided in 1910.110(b)(7)(iv), (19)(iii), and (19)(viii) of this section;

(3) Pressure gage connections as provided in 1910.110(b)(7)(v) of this section, or provided in the following subdivisions (iv), (vi), and (vii) of this checklist? (d)(3)(iii)

Where an excess flow valve is not required in the withdrawal service line, are the following items complied with:

(a) Such systems' total water capacity never exceeds 2,000 gallons?

(b) Is the discharge from the service outlet controlled by a suitable manually operated shutoff valve which is:

(1) Threaded directly into the service outlet of the container; or

(2) Is an integral part of a substantial fitting threaded into or on the service outlet of the container; or

(3) Threaded directly into a substantial fitting threaded into or on the service outlet of the container?

(c) Is the shutoff valve equipped with an attached handwheel or the equivalent?

(d) Does the controlling orifice between the contents of the container and the outlet of the shutoff valve never exceed five-sixteenths of an inch in diameter for vapor withdrawal systems, and one-eighth inch in diameter for liquid withdrawal systems?

YES NO

(e) Is an approved pressure-reducing regulator directly attached to the outlet of the shutoff valve and is it rigidly supported, or is there an approved pressure-reducing regulator attached to the outlet of the shutoff valve by means of a suitable flexible connection, if the regulator is adequately supported and properly protected on or at the tank? (d)(3)(iv)

Are all inlet and outlet connections except safety relief valves, liquid level gaging devices, and pressure gages on containers of 2,000 gallons water capacity or more, and on any container used to supply fuel directly to an internal combustion engine, labeled to designate whether they communicate with a vapor or liquid space? (d)(3)(v)

When containers are equipped with a quick-closing internal valve, in lieu of an excess flow valve, is the internal mechanism for such valves provided with a secondary control which shall be equipped with a fusible plug (not over 220°F. melting point), which will cause the internal valve to close automatically in case of fire? (d)(3)(vi)

Are precautions taken to insure that no more than two plugged openings are on a container of 2,000 gallons or less water capacity? (d)(3)(vii)

Are all containers of 125 gallons water capacity or more that were manufactured after July 1, 1961, provided with an approved device for liquid evacuation? (d)(3)(viii)

Is the size of this device at least three-fourths inch National Pipe Thread minimum? (d)(3)(viii)

Safety Devices. (d)(4)

Do all safety devices comply with the following items? (d)(4)(i)

Are all container safety relief devices located on the containers, and do they have direct communication with the vapor of space of the container? (d)(4)(i)(a)

In industrial and gas manufacturing plants does the discharge pipe from safety relief valves on pipelines within a building discharge vertically upward, and are they piped to a point outside a building? (d)(4)(i)(b)

Are safety relief device discharge terminals located so as to provide protection against physical damage? (d)(4)(i)(c)

Are such discharge pipe fitted with loose raincaps? (d)(4)(i)(c)

Are return bends and restrictive pipe-fittings prohibited? (d)(4)(i)(c)

Where discharge lines from two or more safety relief devices run into a common discharge header, is the cross-sectional area of such header at least equal to the sum of the cross-sectional area of the individual discharge lines, and is the setting of safety relief valves the same? (d)(4)(i)(d)

Is each storage container of over 2,000 gallons water capacity provided with a suitable pressure gage? (d)(4)(i)(e)

Is the final stage regulator of an LP-Gas system equipped on the low-pressure side with a relief valve which is set to start to discharge with the time limits specified in Table H-30? (See Appendix.) (d)(4)(i)(f)

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	YES	NO
Where regulators or pressure relief valves are installed inside a building, is the relief valve and the space above the regulator and relief valve diaphragms vented to the outside air? (d)(4)(i)(g)		
When such venting is discharged into the outside air, is the discharge outlet located not less than 3 feet horizontally away from any opening into the building which is below such discharge? (d)(4)(i)(g)		
Are safety devices for aboveground containers provided as follows: (d)(4)(ii)		
On containers of 1,200 gallons water capacity or less, which may contain liquid fuel when installed aboveground, is the rate of discharge required by the listing in 1910.110(b)(10)(ii) and is such discharge provided by a spring-loaded relief valve or valves? (d)(4)(ii)(a)		
In addition to the required spring-loaded relief valve(s), if suitable fuse plug(s) are used, does the total discharge area of the fuse plug(s) for each container not exceed 0.25 square inch? (d)(4)(ii)(a)		
Does the fusible metal of the fuse plugs have a yield temperature of 208°F. minimum and 220°F. maximum? (d)(4)(ii)(b)		
Do relief valves and fuse plugs have direct communication with the vapor space of the container? (d)(4)(ii)(b)		
On a container having a water capacity greater than 125 gallons, but not over 2,000 gallons, is the discharge from the safety relief valves vented away from the container vertically upwards, and unobstructed to the open in such a manner as to prevent any impingement of escaping gas upon the container? (d)(4)(ii)(c)		
Are such vents provided with loose-fitting rain caps? (d)(4)(ii)(c)		
Is suitable provision made for draining condensate which may accumulate in the relief valve or discharge pipe? (d)(4)(ii)(c)		
On containers of 125 gallons water capacity or less, is the discharge from safety relief devices located not less than 5 feet horizontally away from any opening into the building below the level of such discharge? (d)(4)(ii)(d)		
On a container having a water capacity greater than 2,000 gallons, is the discharge from the safety relief valves vented away from the container vertically upwards to a point at least 7 feet above the container? (d)(4)(ii)(e)		
Is such vent unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container? (d)(4)(ii)(e)		
Is the vent provided with loose-fitting rain caps? (d)(4)(ii)(e)		
Are suitable provisions made so that any liquid or condensate that may accumulate inside of the safety relief valve or its discharge pipe will not render the valve inoperative? (d)(4)(ii)(e)		
If a drain is used, are means provided to protect the container, adjacent containers, piping, or equipment against impingement of flame resulting from ignition of product escaping from the drain? (d)(4)(ii)(e)		

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES
(d) Systems Utilizing Containers Other Than DOT Containers.

	YES	NO
On all containers which are installed underground and which contain no liquid fuel until buried and covered, the rate of discharge of the spring-loaded relief valve installed thereon may be reduced to a minimum of 30 percent of the rate of discharge specified in the listing under 1910.110(b)(10)(ii). (d)(4)(iii)		
Are precautions taken to insure that containers as listed in the section immediately above, will not be uncovered after installation, until the liquid fuel has been removed therefrom? (d)(4)(iii)		
Are containers which may contain liquid fuel before being completely covered with earth considered aboveground containers when determining the rate of discharge requirement of the relief valves? (d)(4)(iii)		
On underground containers of more than 2,000 gallons water capacity, is the discharge from safety relief devices piped vertically and directly upward to a point at least 7 feet above the ground? (d)(4)(iv)		
If there is a probability of the manhole or housing becoming flooded, are precautions taken to insure that the discharge from regulator vent lines will be above the highest probable water level? (d)(4)(iv)		
Are all manholes or housings provided with ventilated louvers or their equivalent? (d)(4)(iv)		
Does the area of such openings equal or exceed the combined discharge areas of the safety relief valves and other vent lines which discharge their content into the manhole housing? (d)(4)(iv)		
Are vaporizers provided with the following safety devices: (d)(4)(v)		
Are vaporizers of less than 1 quart total capacity that are heated by the ground or the surrounding air, and are not equipped with safety relief valves, have adequate tests certified to by the Underwriters Laboratories, Inc., or the Factory Mutual Engineering Corporation? (d)(4)(v)(a)		
Is the use of fusible plugs on vaporizers prohibited? (d)(4)(v)(b)		
Do safety relief valves on vaporizers in industrial and gas manufacturing plants, within a building, have their discharge piped to a point outside the building and upwards? (d)(4)(v)(c)		
Reinstallation of Containers. (d)(5)		
Are precautions taken to insure that containers that are reinstalled do not show any evidence of harmful external corrosion or other damage? (d)(5)		
On containers that are reinstalled underground, is the corrosion resistant coating put in good condition? (d)(5)		
Where containers are reinstalled aboveground, do the safety devices and gaging devices comply with the items in 1910.110(b)(4) and 1910.110(b)(19) of this checklist? (d)(5)		
Capacity of Containers. (d)(6)		
Are storage containers limited to 90,000 gallons water capacity? (d)(6)		

	YES	NO
Installation of Storage Containers. (d)(7)		
Are containers that are installed aboveground, except for those that are known as "skid tanks", provided with substantial masonry or noncombustible structural parts on firm masonry foundation? (d)(7)(i)		
Are all aboveground containers supported as follows: (d)(7)(ii)		
Are horizontal containers mounted on saddles in such a manner as to permit expansion and contraction? (d)(7)(ii)(a)		
If structural metal supports are employed, are they protected against fire in an approved manner? (d)(7)(ii)(a)		
Are suitable means of preventing corrosion provided on that portion of the container in contact with the foundations or saddles? (d)(7)(ii)(a)		
Where containers of 2,000 gallons water capacity or less are installed with non-fireproofed ferrous metal supports, are they mounted on concrete pads or footings? (d)(7)(ii)(b)		
In such installations, is the distance from the outside bottom of the container shell to the concrete pad, footings, or the ground, less than 24 inches? (d)(7)(ii)(b)		
If any container is installed with non-fireproofed ferrous metal supports and is mounted on concrete pads or footings, does the distance from the outside bottom of the container to the ground not exceed 5 feet, if the container is in an isolated location? (d)(7)(iii)		
If containers are partially buried, do they comply with the following items: (d)(7)(iv)		
Is the portion of the container below the surface and for a vertical distance not less than 3 inches above the surface of the ground, protected to resist corrosion, and is the container protected against settling and corrosion as required for fully buried containers? (d)(7)(iv)(a)		
Are the spacing requirements, as listed in Table H-23 (see Appendix) met? (d)(7)(iv)(b)		
Is the relief valve capacity the same as required for aboveground containers? (d)(7)(iv)(c)		
Are containers so located as not to be subject to vehicular damage, or where they are adequately protected against such damage? (d)(7)(iv)(d)		
Are the filling densities as required for aboveground tanks? (d)(7)(iv)(e)		
Is there at least 6 inches of earth on top of containers buried underground? (d)(7)(v)		
If an underground container might be subject to abrasive action or physical damage due to vehicular traffic or other causes, are the following items complied with: *(a)* Are they placed at least 2 feet below the grade; or *(b)* Are they otherwise protected against such physical damage?		
Since it is not necessary to cover the portion of the container to which manhole and other connections are affixed, are necessary precautions provided against vehicular damage? (d)(7)(v)		
Are containers securely anchored or weighted when necessary to prevent floating? (d)(7)(v)		
Are containers given a protective coating before being placed underground? (d)(7)(vi)(a)		

	YES	NO
Is this coating equivalent to hot-dip galvanizing or to two coatings of red lead followed by a heavy coating of coal tar or asphalt? (d)(7)(vi)(a)		
When lowering the container into place, is care exercised to prevent damage to the coating? (d)(7)(vi)(a)		
Is any damage to the coating repaired before backfilling? (d)(7)(vi)(a)		
Are containers set on a firm foundation and surrounded with earth or sand firmly tamped in place? (d)(7)(vi)(b)		
Are containers with foundations attached, popularly known in the industry as "skid tanks", designed, installed, and used in accordance with these rules, subject to the following provisions: (d)(7)(vii)		
If they are to be used at a given general location for a temporary period not to exceed 6 months, are they provided with adequate ferrous metal supports? (d)(7)(vii)(a)		
If the outside bottom of the container shell is more than 5 feet above the surface of the ground, is it provided with fire-resisting supports? (d)(7)(vii)(b)		
Is the bottom of the skids not less than 2 inches or more than 12 inches below the outside bottom of the container shell? (d)(7)(vii)(c)		
Are flanges, nozzles, valves, fittings, and the like, having communication with the interior of the container, protected against physical damage? (d)(7)(vii)(d)		
When not permanently located on fire-resisting foundations, are piping connections sufficiently flexible to minimize the possibility of breakage or leakage of connections if the container settles, moves, or is otherwise displaced? (d)(7)(vii)(e)		
Are skids, or lugs for attachment of skids, secured to the container in accordance with the code or rules under which the container is designed and built? (d)(7)(vii)(f)		
Are such skids designed to withstand loading in any direction equal to four times the weight of the container and attachments when filled to the maximum permissible loaded weight? (d)(7)(vii)(f)		
Is all field welding, where necessary, limited to only on saddle plates or brackets which were applied by the manufacturer of the tank? (d)(7)(viii)		
For aboveground containers, is there secure anchorage or adequate pier height provided against possible container flotation wherever sufficiently high floodwater might occur? (d)(7)(ix)		
When permanently installed containers are interconnected, are provisions made to compensate for expansion, contraction, vibration, and settling of containers, and interconnecting piping? (d)(7)(x)		
Where flexible connections are used, are they of the approved type and designed for a bursting pressure of not less than five times the vapor pressure of the product at 100°F.? (d)(7)(x)		
Is the use of nonmetallic hose prohibited for permanently interconnecting such containers? (d)(7)(x)		

Do container assemblies listed for interchangeable installation aboveground or underground conform to the requirements for aboveground installations with respect to safety relief capacity and filling density? (d)(7)(xi)

If such container assemblies are installed on aboveground tanks, do they meet all other requirements for aboveground installations? (d)(7)(xi)

When such container assemblies are installed underground, are all other requirements for underground installations complied with? (d)(7)(xi)

Protection of Container Accessories. (d)(8)

Are valves, regulating, gaging, and other container accessory equipment protected against tampering and physical damage? (d)(8)(i)

Are such accessories also protected during the transit of containers intended for installation underground? (d)(8)(i)

On underground or combination aboveground-underground containers, are the following items met:

Is the service valve handwheel at least 4 inches above the container?

Is the terminal for connecting the hose, and the opening through which there can be a flow from safety relief valves, at least 4 inches above the container?

Is the relief valve opening in the dome or housing?

Are underground systems so installed that all the above openings, including the regulator vent, are located above the normal maximum water table? (d)(8)(ii)

Are all connections to underground containers located within a substantial dome, housing, or manhole, and is the access thereto protected by a substantial cover? (d)(8)(iii)

Drips for Condensed Gas. (d)(9)

Where vaporized gas on the low-pressure side of the system may condense to a liquid at normal operating temperatures and pressures, are suitable means provided for revaporization of the condensate? (d)(9)

Damage From Vehicles. (d)(10)

Are precautions taken to insure that damage from vehicular traffic will not occur? (d)(10)

Drains. (d)(11)

Are drains or blowoff lines prohibited from being directed into or in proximity to sewer systems used for other purposes? (d)(11)

General Provisions Applicable to Systems in Industrial Plants and to Bulk Filling Plants. (d)(12)

Where standard watch service is provided, is it extended to the LP-Gas installation, and are personnel properly trained? (d)(12)(i)

Where loading and unloading is done during nighttime hours, are adequate lights provided to illuminate storage containers, control valves, and other equipment? (d)(12)(ii)

Are there suitable roadways or means of access for extinguishing equipment? (d)(12)(iii)

Is the container area, including the container appurtenances, pumping equipment, loading and unloading facilities, and cylinder-filling facilities properly guarded or otherwise protected? (d)(12)(iv)

Are there at least two means of emergency access into the protected area? (d)(12)(iv)

Container-Charging Plants. (d)(13)

Are the following distances maintained from the container-charging room?

(a) Is it ten feet from bulk storage containers?

Are the following distances maintained for tank truck filling station outlets:

(b) Ten feet from pumps and compressors if housed in one or more separate buildings? (d)(13)(ii)

When pumps or compressors are housed in a separate building, are the following distances maintained from such building:

(a) Ten feet from bulk storage tanks?
(c) Twenty-five feet from sources of ignition? (d)(13)(iii)

When a part of the container-charging building is used for a boiler room, or where open flames or similar sources of ignition exist or are employed, is the space occupied by such flame producing operations separated from the container-charging room by a partition wall or walls of fire-resistant construction continuous from floor to roof or ceiling? (d)(13)(iv)

Are such separation walls without openings, and are they joined to the floor, other walls, and ceiling or roof in a manner to effect a permanent gas-tight joint? (d)(13)(iv)

Is the electrical equipment and installations, installed in conformance with the items under 1910.110(b)(17) and (18) of this checklist on page H-61? (d)(13)(v)

Fire Protection. (d)(14)

Is there at least one approved portable fire extinguisher having a minimum rating of 12-B,C. in each bulk plant? (d)(14)(i)

In industrial installations involving containers of 150,000 gallons aggregate water capacity or more, are provisions made for an adequate supply of water at the container site for fire protection in the container area? (d)(14)(ii)

Are water hydrants readily accessible and so spaced as to provide water protection for all containers? (d)(14)(ii)

Are sufficient lengths of firehose provided at each hydrant location on a hose cart, or other means provided to facilitate easy movement of the hose in the container area? (d)(14)(ii)

Is each hoseline equipped with a combination fog nozzle? (d)(14)(ii)

Is a shelter provided to protect the hose and its conveyor from the weather? (d)(14)(ii)

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

(d) Systems Utilizing Containers Other Than DOT Containers.

YES NO

Lighting. (d)(16)

Is the electrical equipment and installations used for lighting, installed in accordance with the items under 1910.110(b)(17) and (18) of this checklist on Page H-61? (d)(16)

Vaporizers for Internal Combustion Engines. (d)(17)

Do the vaporizers for internal combustion engines comply with the provisions of the items in this checklist under 1910.110(e)(8) which follows in sequence? (d)(17)

Gas Regulating and Mixing Equipment for Internal Combustion Engines. (d)(18)

Do gas regulating and mixing equipment for internal combustion engines comply with 1910.110(e)(9) of this checklist, which follows in normal sequence? (d)(18)

(e) Liquefied Petroleum Gas as a Motor Fuel.

Application. (e)(1)

The following items apply to internal combustion engines, fuel containers, and pertinent equipment for the use of liquefied petroleum gases as a motor fuel on easily movable, readily portable units including self-propelled vehicles. (e)(1)(i)

All of the items under 1910.110(b) of this checklist apply to the above vehicles and installations. (e)(1)(i)

General. (e)(2)

Are passenger-carrying vehicles prohibited from being fueled while passengers are on board? (e)(2)(ii)

Are all industrial trucks equipped with permanently mounted fuel containers charged outdoors? (e)(2)(iii)

Does charging equipment comply with the items in this checklist under 1910.110(h), which follows in normal sequence? (e)(2)(iii)

Do all of the LP-Gas fueled industrial trucks comply with the Standard for Type Designations, Areas of Use, Maintenance and Operation of Powered Industrial Trucks, NFPA 505-1969? (e)(2)(iv)

Where fueling operations involve venting to the atmosphere, are all engines on vehicles required to be shut down while fueling? (e)(2)(v)

Design Pressure and Classification of Fuel Containers. (e)(3)

Except as outlined in the items in (ii) and (iii) below, is Table H-32 (see Appendix) used as a guide in classification of fuel containers? (e)(3)(i)

Are fuel containers for use in industrial trucks either DOT containers authorized for LP-Gas service, that have a minimum service pressure of 240 p.s.i.g., or, as an alternate are they Container Type 250, under 1950 and later ASME codes? (e)(3)(ii)

When containers manufactured and maintained under DOT specifications and regulations are used as fuel containers, do they comply with all of the following items in this checklist under this section? (e)(3)(iii)

Are all container inlets and outlets except safety relief valves and gaging devices labeled to designate whether they communicate with vapor or liquid space? (e)(3)(iv)

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES

(e) Liquefied Petroleum Gas as a Motor Fuel.

YES NO

Installation of Fuel Containers. (e)(4)

Are containers located in a place and in a manner to minimize the possibility of damage to the containers? (e)(4)(i)

Are containers located in the rear of trucks and buses properly and substantially protected by bumpers? (e)(4)(i)

Are fuel containers on passenger-carrying vehicles installed as far from the engine as is practicable? (e)(4)(i)

Is the passenger space and any space containing radio equipment sealed from the container space? (e)(4)(i)

Is the container compartment vented to the outside? (e)(4)(i)

If the fuel container is mounted near the engine or the exhaust system, is the container shielded against direct heat radiation? (e)(4)(i)

Are containers so installed with at least the minimum road clearance of the vehicle under maximum spring deflection? (e)(4)(ii)

Is this minimum clearance to the bottom of the container, or to the lowest fitting on the container or housing, whichever is the lower? (e)(4)(ii)

Are permanent and removable fuel containers securely mounted to prevent jarring loose, slipping, or rotating? (e)(4)(iii)

Are the fastenings for such fuel containers designed and constructed to withstand static loading in any direction equal to twice the weight of the tank and attachments when filled with fuel using a safety factor of four, based on the ultimate strength of the material to be used? (e)(4)(iii)

When field welding is necessary, is it made only on saddle plates, lugs or brackets, originally attached to the container by the tank manufacturer? (e)(4)(iii)

Are fuel containers on buses permanently installed? (e)(4)(iv)

Are containers from which vapor only is to be withdrawn, installed and equipped with suitable connections to minimize the accidental withdrawal of liquid? (e)(4)(v)

Valves and Accessories. (e)(5)

Do container valves and accessories have a rated working pressure of at least 250 p.s.i.g., and are they of a type suitable for liquefied petroleum gas service? (e)(5)(i)

Is the filling connection fitted with an approved double back-pressure check valve, or as an alternate, a positive shutoff in conjunction with an internal back-pressure check valve? (e)(5)(ii)

Are main shutoff valves on the container, on liquid and vapor lines, readily accessible? (e)(5)(ii)

Are all connections to containers having openings for the flow of gas larger than No. 54 drill size, equipped with approved automatic excess flow valves? (e)(5)(iii)

Exception: In the case of containers used solely in farm tractor service.

	YES	NO
Liquid-level gaging devices: (e)(5)(iv)		
Is the use of variable liquid-level gages which require the venting of fuel to the atmosphere prohibited on fuel containers of industrial trucks? (e)(5)(iv)(a)		
On portable containers that may be filled in the vertical and/or horizontal position, does the fixed liquid-level gage indicate maximum permitted filling level for both vertical and horizontal filling? (e)(5)(iv)(b)		
Is the container oriented to place the safety relief valve in communication with the vapor space? (e)(5)(iv)(b)		
Where containers used solely in farm tractor service, and are charged at a point at least 50 feet from any important building, is the fixed liquid-level gaging device so constructed so that the flow will never exceed that passed by a No. 31 drill-size opening? (e)(5)(iv)(c)		
Are fittings equipped with such restricted drill size opening and the container on which they are used marked to indicate the size of the opening? (e)(5)(iv)(c)		
Are all valves and connections on containers adequately protected to prevent damage due to accidental contact with stationary objects or from loose objects thrown up from the road? (e)(5)(iv)(d)		
Are all valves safeguarded against damage due to collision, overturning or other accident? (e)(5)(iv)(d)		
On removable type containers for farm tractors, is the protection for the fittings permanently attached to the container? (e)(5)(iv)(d)		
When removable fuel containers are used, are means provided in the fuel system to minimize the escape of fuel when the containers are exchanged? (e)(5)(iv)(e)		
Piping – Including Pipe, Tubing and Fittings. (e)(6)		
Is the pipe from fuel container to first-stage regulator at least schedule 80 wrought iron or steel, brass or copper, or seamless copper, brass, or steel tubing? (e)(6)(i)		
Does steel tubing have a minimum wall thickness of 0.049 inch? (e)(6)(i)		
Is steel pipe or tubing adequately protected against exterior corrosion? (e)(6)(i)		
Is copper tubing of the types K or L, or the equivalent? (e)(6)(i)		
Is the minimum wall thickness of copper tubing 0.032 inch? (e)(6)(i)		
Is the use of aluminum pipe or tubing prohibited? (e)(6)(i)		
In the case of removable containers, are approved flexible connections used between the container and the fuel line? (e)(6)(i)		
Is all piping installed, braced, and supported so as to reduce to a minimum the possibility of vibration strains or wear? (e)(6)(ii)		
Safety Devices. (e)(7)		
Are spring-loaded internal type safety relief valves used on all motor fuel containers? (e)(7)(i)		
Is the discharge outlet from safety relief valves located on the outside of enclosed spaces, and as far as practicable from possible sources of ignition? (e)(7)(ii)		

	YES	NO
Is the discharge vented upward within 45 degrees of the vertical in such a manner as to prevent impingement of escaping gas upon containers, or parts of vehicles, or on vehicles in adjacent lines of traffic? (e)(7)(ii)		
Are rain caps or other protectors used to keep water and dirt from collecting in the valve? (e)(7)(ii)		
When a discharge line from the container safety relief valve is used, is the line of metal other than aluminum? (e)(7)(iii)		
Is such line sized, located, and maintained so as not to restrict the required flow of gas from the safety relief valve? (e)(7)(iii)		
Is such discharge line capable of withstanding the pressure resulting from the discharge of vapor when the safety relief valve is in the full open position? (e)(7)(iii)		
When flexibility is necessary in this discharge line, is flexible metal hose or tubing used? (e)(7)(iii)		
When portable containers are equipped for volumetric filling and they can be filled in either the vertical or horizontal position, are precautions taken to insure that the safety relief valve is in communication with the vapor space? (e)(7)(iv)		
Are the applicable requirements of 1910.110(b)(10)(xii) of this checklist used for the requirements of hydrostatic relief valves? (e)(7)(v)		
Vaporizers. (e)(8)		
Do vaporizers and any part thereof and other devices that may be subjected to container pressure have a design pressure of at least 250 p.s.i.g.? (e)(8)(i)		
Does each vaporizer have a valve or suitable plug which will permit substantially complete draining of the vaporizer? (e)(8)(ii)		
Is such valve or plug located at or near the lowest portion of the section occupied by the water or other heating medium? (e)(8)(ii)		
Are vaporizers securely fastened so as to minimize the possibility of becoming loosened? (e)(8)(iii)		
Is each vaporizer permanently marked at a visible point as follows: *(a)* With the design pressure of the fuel-containing portion in p.s.i.g., and *(b)* With the design pressure of the fuel-containing portion of the vaporizer in pounds? (e)(8)(iv)		
Are devices to supply heat directly to a fuel container equipped with an automatic device to cut off the supply of heat, before the pressure inside the fuel container reaches 80 percent of the "start-to-discharge" pressure setting of the safety relief device on the fuel container? (e)(8)(v)		
If engine exhaust gases are used as a direct source of heat supply for the vaporization of fuel, are the materials of construction of those parts of the vaporizer in contact with exhaust gases resistant to the corrosive action of exhaust gases and is the vaporizer system designed to prevent excessive pressures? (e)(8)(vi)		
Are fusible plugs prohibited from being installed on vaporizers? (e)(8)(vii)		

Gas Regulating and Mixing Equipment. **(e)(9)**

Is approved automatic pressure reducing equipment installed in a secure manner between the fuel supply container and gas-air mixer? (e)(9)(i)

Is an approved automatic shutoff valve provided in the fuel system at some point ahead of the inlet of the gas-air mixer? (e)(9)(ii)

Is such automatic shutoff valve designed to prevent flow of fuel to the mixer when the ignition is off and the engine is not running? (e)(9)(ii)

In the case of industrial trucks and engines operating in buildings, is the automatic shutoff valve designed to operate if the engine should stop? (e)(9)(ii)

NOTE: Atmospheric type regulators are considered adequate as an automatic shutoff valve only in cases of outdoor operation.

Are precautions taken to insure that the source of the air for combustion is completely isolated from the passenger compartment, ventilating system, or air conditioning system? (e)(9)(iii)

Capacity of Containers. **(e)(10)**

Are single fuel containers used on passenger-carrying vehicles limited to 200 gallons water capacity? (e)(10)

Are single fuel containers on other vehicles normally operating on the highway limited to 300 gallons water capacity? (e)(10)

Stationary Engines in Buildings. **(e)(11)**

Do stationary engines and gas turbines installed in buildings, including portable engines used instead of or to supplement stationary engines, comply with NFPA 37-1970, and the items in this checklist under the provisions of paragraphs (b), (c), and (d) of this section? (e)(11)

Portable Engines in Buildings. **(e)(12)**

Are portable engines used in buildings only for emergency use, except as authorized in NFPA 37-1970? (e)(12)(i)

Are exhaust gases from portable engines in buildings discharged to outside of the building, or to an area where they will not constitute a hazard? (e)(12)(ii)

Are provisions made to supply sufficient air for combustion and cooling of portable engines? (e)(12)(iii)

Is there an approved automatic shutoff valve provided in the fuel system ahead of the engine? (e)(12)(iv)

Is such valve designed to prevent flow of fuel to the engine when the ignition is off or if the engine should stop? (e)(12)(iv)

Does the capacity of LP-Gas containers used with such engines comply with the items under paragraph (c)(5) of this checklist? (e)(12)(v)

Industrial Trucks Inside Buildings. **(e)(13)**

Are LP-Gas containers used on industrial trucks inside of buildings limited to two containers? (e)(13)(ii)

Are trucks precluded from being parked and left unattended in areas of possible excessive heat or sources of ignition? (e)(13)(v)

Garaging LP-Gas-Fueled Vehicles. **(e)(14)**

When LP-Gas-fueled vehicles are stored or serviced inside garages, are provisions made to insure there are no leaks in the fuel system? (e)(14)(i)

Are provisions made to insure that the fuel tanks are not filled beyond the maximum filling capacity? (e)(14)(i)

When LP-Gas-fueled vehicles are being repaired in garages, are precautions taken to insure that the container shutoff valve is closed except when fuel is required for engine operation? (e)(14)(ii)

Are precautions taken to insure that such vehicles will not be parked near sources of heat, open flames, or similar sources of ignition? (e)(14)(iii)

Are precautions taken to insure that vehicles will not be parked near open pits unless such pits are adequately ventilated? (e)(14)(iii)

(f) Storage of Containers Awaiting Use or Resale.

Application. **(f)(1)**

The following items of this checklist apply to the storage of portable containers not in excess of 1,000 pounds water capacity, filled or partially filled, at user location but not connected for use, or in storage for resale by dealers or resellers. (f)(1)

General. **(f)(2)**

Are containers in storage located so as to minimize exposure to excessive temperature rise, physical damage, or tampering by unauthorized persons? (f)(2)(i)

When containers are stored inside, are precautions taken to insure that such storage is not located near exits, stairways, or in areas normally used or intended for the safe exit of people? (f)(2)(ii)

Are container valves protected while in storage in accordance with the following requirements: (f)(2)(iii)

By setting into recess of container to prevent the possibility of their being struck if the container is dropped upon a flat surface? (f)(2)(iii)(a)

By a ventilated cap or collar, fastened to the container, capable of withstanding a blow from any direction equivalent to that of a 30-pound weight dropped 4 feet? (f)(2)(iii)(b)

Is the construction of the ventilated cap or collar such that a blow will not be transmitted to a valve or other connection? (f)(2)(iii)(b)

Are the outlet valves of containers in storage kept closed? (f)(2)(iv)

When empty containers are stored inside, are they considered as full containers for the purpose of determining the maximum quantity of LP-Gas permitted by this paragraph? (f)(2)(v)

Storage Within Buildings Not Frequented by the Public (such as industrial buildings). (f)(4)

Is the quantity of LP-Gas stored limited to 300 pounds, with the exception as provided in the items under (5) below? (f)(4)(i)

If containers are carried as a part of service equipment on highway mobile vehicles, that quantity of LP-Gas does not have to be included in the total limit, as outlined in item (i) above, but vehicles must be kept in private garages with only one container per vehicle with an LP-Gas capacity of not more than 100 pounds. (f)(4)(ii)

Are precautions taken to insure that all container valves are closed? (f)(4)(ii)

Storage Within Special Buildings or Rooms. (f)(5)

Is the quantity of LP-Gas stored in special buildings or rooms limited to 10,000 pounds? (f)(5)(i)

Are the walls, floors, ceilings of container storage rooms that are within or adjacent to other parts of the building constructed of material having at least a 2-hour fire resistance rating? (f)(5)(ii)

Is at least a portion of the exterior walls or roof having an area not less than 10 percent of that of the combined area of the enclosing walls and roof, made up of explosion relieving construction? (f)(5)(iii)

Is each opening from such storage rooms to other parts of the building protected by a 1½ hour (b) fire door listed by Underwriters Laboratories, Inc.? (f)(5)(iv)

Are such rooms precluded from having open flames for heating or lighting? (f)(5)(v)

Are such rooms adequately ventilated from both top and bottom to the outside only? (f)(5)(vi)

Are such openings for vents at least 5 feet away from any other opening into any building? (f)(5)(vi)

Are the floors of such rooms at least below ground level? (f)(5)(vii)

Is the space below the floor of solid fill or properly ventilated to the open air? (f)(5)(vii)

Are such storage rooms precluded from being located adjoining the line of property occupied by schools, churches, hospitals, athletic fields or other points of public gathering? (f)(5)(viii)

Is fixed electrical equipment installed in accordance with the items in 1910.110(b)(18) of this checklist? (f)(5)(ix)

Storage Outside of Buildings. (f)(6)

Is Table H-33 (see Appendix) used for the location of storage in relation to:

(a) the nearest important building or group of buildings;

(c) busy thoroughfares? (f)(6)(i)

Are containers stored in a suitable enclosure, or are they otherwise protected against tampering? (f)(6)(ii)

Fire Protection. (f)(7)

Are storage locations other than supply depots separated and located apart from dealer, reseller, or user establishments provided with at least one approved portable fire extinguisher having a minimum rating of 8-B,C? (f)(7)

(g) LP-Gas System Installations on Commercial Vehicles.

Application. (g)(1)

The following items apply to LP-Gas-system installations on vehicles used for commercial or construction purposes, to all exchangeable container systems with container capacities greater than 105 pounds water capacity, and to systems using containers permanently mounted on vehicles.

The items of this checklist under 1910.110(b) apply to these vehicles, unless otherwise noted. (g)(1)

Construction and Marking of Containers. (g)(2)

Are containers constructed in accordance with 1910.110(b)(3) of this checklist, and are they marked in accordance with the applicable requirements of paragraph 1910.110(b)(5)? (g)(2)

Do the containers also meet the following requirements? (g)(2)

Are containers that are designed for use as portable cylinders constructed in accordance with Department of Transportation specifications, and in accordance with the items under 1910.110(b)(3)(v) of this checklist? (g)(2)(i)

Are all other containers designed for permanent mounting or for portable or semiportable use, constructed as provided for in the items under 1910.110(b)(3)(i) and (iv) of this checklist? (g)(2)(ii)

Is the mounting, securing, and protection of such containers in accordance with the items covered in the following (iii) and (iv) checklist? (g)(2)(ii)

Do container valves and accessories and containers permanently installed, meet the requirements of the items under (a) which follows? (g)(2)(iii)

Is the mounting of permanently installed containers in accordance with the items under (b) which follows? (g)(2)(iii)

(1) Are nonrecessed container fittings and appurtenances protected against damage by either:
(i) Their location;
(ii) The vehicle or bumper, or
(iii) A protective housing? (g)(2)(iii)(a)

(iii) Does protective housing, if used, comply with the requirements under which the tanks are fabricated with respect to design and construction?

If protective housing is used, is it designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments, when filled with the lading, using a safety factor of not less than four based on the ultimate strength of the material to be used? (g)(2)(iii)(a)

(iii) Is such protective housing provided with a weather cover if necessary to insure proper operation of valves and safety devices? (g)(2)(iii)(a)

(2) Are manually operated shutoff valves or self-closing internal valves kept closed except during transfer operations? (g)(2)(iii)(a)

(1) Are tank motor vehicles with frames that are not an integral part of the tank provided with turnbuckles or similar positive devices for drawing the tank down tight on the frame?

In addition, are suitable stops or anchors attached to the frame, and/or to the tank to prevent relative motion between them due to starting, stopping, and turning?

Are such stops and anchors so installed as to be readily accessible for inspection and maintenance? (g)(2)(iii)(b)

(2) On any tank motor vehicle designed and constructed so that the cargo tank constitutes in whole or in part the stress member used in lieu of a frame, is the cargo tank supported by external cradles subtending at least 120 degrees of the shell circumference?

Do the design calculations include beam stress, shear stress, torsion stress, bending moment, and acceleration stress for the cargo tank as a whole, using a factor of safety of four, based on the ultimate tensile strength of the material?

Are maximum concentrated stresses which might be created at pads and cradles due to shear, bending, and torsion also calculated in accordance with Appendix G of the American Society of Mechanical Engineers, Unfired Pressure Vessel Code, 1968?

Are fully loaded vehicles assumed to be operating under highway conditions equal to two "g" loading?

Are the effects of fatigue taken into consideration?

If cargo tanks are mounted on frames supported by longitudinal members attached to pads, are the above-stated factors taken into account? (g)(2)(iii)(b)

(3) Where any tank support is attached to any part of a tank head, are the stresses imposed upon the head provided for as required in (2) above? (g)(2)(iii)(b)

(4) Are tank supports, stops, anchors, and bumpers prohibited from being welded directly to the tank, and are they attached by means of pads of the same material as the tank?

Are the pads at least one-fourth inch thick, or the thickness of the shell material, if less, but no greater than the shell material?

Does each pad extend at least four times its thickness, in each direction, beyond the weld attaching the support, bumper, stop, or anchor?

Is each pad preformed to an inside radius no greater than the outside radius of the tank at the place of attachment?

Is each pad corner rounded to a radius of at least one-fourth the width of the pad, and no greater than one-half the width of the pad?

If weepholes and telltale holes are used, are they drilled or punched before the pads are attached to the tank?

Is each pad attached to the tank by continous fillet welding, using filler material having properties conforming to the recommendations of the maker of the shell and head material? (g)(2)(iii)(b)

Do portable or semiportable containers (skid tanks as covered by paragraph 1910.110(d)(7)(vii), meet the applicable requirements of items (a) to (f) inclusive with regard to container valves and accessories? (g)(2)(iv)

Do portable or semiportable containers (skid tanks as covered by paragraph 1910.110(d)(7)(vii), meet the requirements of 1910.110(e)(4)(iii) of this checklist as to mounting? (g)(2)(iv)

Are containers that are designed for permanent installation as part of systems under paragraph 1910.110(d) prohibited from being used? (g)(2)(iv)

Are nonrecessed container fittings and appurtenances protected against damage by either:

(1) Their location;
(2) The vehicle frame or bumper, or
(3) A protective housing.

(3) If the protective housing is used, does it comply with the requirements under which the tanks are fabricated with respect to design and construction, and is it designed to withstand static loadings in any direction equal to twice the weight of the tank and attachments when filled with the lading using a safety factor of not less than four, based on the ultimate strength of the material to be used?

Is the protective housing provided with a weather cover if necessary to insure proper operation of valves and safety devices? (g)(2)(iv)(a)

Are filling connections provided with approved automatic back pressure check valves, excess flow check valves or quick-closing internal valves? (g)(2)(iv)(b)

NOTE: This is **not** required where the filling and discharge connect on a common opening in the container shell, and that opening is fitted with a quick-closing internal valve as specified in (c) below.

Is every inlet and outlet connection equipped with a manually or automatically operated shutoff valve? (g)(2)(iv)(b)

Are liquid discharge openings on tanks built after September 1, 1965, fitted with a remotely controlled internal shutoff valve, except those for engine fuel lines? (g)(2)(iv)(b)

Does such valve conform to the following requirements:

(1) Is the seat of the valve inside the tank, or in the opening nozzle or flange, or in a companion flange bolted to the nozzle or flange?

(2) Are all parts of the valve inside the tank, nozzle, or companion flange made of material not subject to corrosion or other deterioration in the presence of the lading?

(3) Is the arrangement of parts such that damage to parts exterior to the tank will not prevent effective seating of the valve?

(4) Is the valve operated normally by mechanical means, by hydraulic means, or by air, or gas pressure?

(5) Are the valves provided with remote means of automatic closure, both mechanical and thermal, in at least two places for tanks over 3,500 gallons water capacity?
Are these remote control stations located at each end of the tank and diagonally opposite each other?
Does the thermal control mechanism have a fusible element with a melting point not over 220°F. or less than 208°F.?
Is there at least one remote control station provided for tanks of 3,500 gallons water capacity or less?
Are such actuating means mechanical? (g)(2)(iv)(b)

Are all other connections to containers, except those used for gaging devices, thermometer wells, safety relief devices, and plugged openings provided with suitable automatic excess flow valves, or in lieu thereof are they fitted with quick-closing internal valves? (g)(2)(iv)(c)

Is the control mechanism for the internal valve provided with a secondary control, remote from the fill or discharge connections? (g)(2)(iv)(c)

Does such control mechanism have a fusible element with a melting point between 220°F. and 208°F.? (g)(2)(iv)(c)

Are manually operated shutoff valves kept closed except during transfer operations? (g)(2)(iv)(d)

Do excess flow valves close automatically at the rated flow of vapor or liquid as specified by the valve manufacturer? (g)(2)(iv)(e)

Is the flow rating of the piping beyond the excess flow valve greater than that of the excess flow valve, and does such rating include valves, fittings, and hose, except when branching or necessary restrictions are incorporated in such a piping system so that flow ratings are less than that of the excess flow valve at the tank, then are additional excess flow valves installed in the piping where such flow rate is reduced? (g)(2)(iv)(e)

Are container inlets and outlets labeled to designate whether they communicate with vapor or liquid space when the container is filled to maximum permitted filling density? (g)(2)(iv)(f)

Capacity of a System. (g)(3)

Are passenger-carrying vehicles prohibited from carrying single fuel containers of not more than 200 gallons water capacity? (g)(3)

Description of a System. (g)(4)

Does a system consist of an assembly of equipment installed on a commercial vehicle? (g)(4)

Location of Containers and Systems. (g)(5)

Are containers prohibited from being installed, transported, or stored temporarily inside any vehicle covered by this paragraph, except as provided by the applicable regulations of DOT? (g)(5)(i)

Are containers, control valves, and regulating equipment suitably protected against damage and weather? (g)(5)(ii)

Are systems that are installed outside of mobile units so located that discharge from safety relief devices will be at least 3 feet horizontally away from any opening into the unit below the level of such discharge? (g)(5)(iii)

If the system is located in a recess vaportight to the inside, are the vent openings in such recess at least 3 feet horizontally away from any opening into the mobile unit below the level of these vents? (g)(5)(iii)

Are fuel connections between tractor and trailer or other vehicle units prohibited? (g)(5)(iv)

Is the container or container carrier secured in place by fastenings designed and constructed with a minimum safety factor of four to withstand loading in any direction equal to twice the weight of the container when filled to normal capacity with LP-Gas? (g)(5)(v)

Container Valves and Accessories. (g)(6)

Are container valves and accessories provided, protected and mounted as follows:

(i) On systems utilizing DOT cylinders are they in accordance with 1910.110(c) (6) of this checklist?
(ii) On all other systems, are they in accordance with the items under this checklist in 1910.110(d)(3)(ii) through (vii)?
(iii) Are portable, semiportable and permanently mounted containers mounted and protected as provided in the items under 1910.110(2)(ii) through (iv) of this checklist? (g)(6)

Safety-Relief Devices. (g)(7)

Are DOT containers provided with safety relief devices as required by the regulations of DOT? (g)(7)(i)

Are ASME containers and API-ASME containers provided with safety relief devices as required by 1910.110(b)(10) of this section, and this checklist? (g)(7)(ii)

Is the final stage regulator of an LP-Gas system equipped on the low-pressure side with a relief valve which is set to start to discharge within the limits specified in Table H-30? (See Appendix.) (g)(7)(iii)(a)

Is the relief valve and space above the regulator and relief valve diaphragms vented to the outside air, and does it terminate at a position to minimize the possibility of vapors accumulating at sources of ignition? (g)(7)(iii)(b)

Whenever equipment on commercial vehicles is of a type designed to be in operation while in transit, are suitable means to stop the flow, such as an excess flow valve or other device, installed? (g)(7)(iv)

Is this device designed to actuate to stop the flow in the event of a break in the fuel supply line? (g)(7)(iv)

Do all excess flow valves comply with the items under 1910.111(b)(7)(iii) of this checklist? (g)(7)(iv)

System Design and Line Pressure. (g)(8)

Do all systems, whether they are vapor withdrawal or liquid withdrawal, comply with the applicable requirements for the type of usage involved? (g)(8)

System Enclosure and Mounting. (g)(9)

Are housings or enclosures designed to provide proper ventilation? (g)(9)(i)

Are hoods, domes, or removable portions of cabinets provided with means to keep them firmly in place during transit? (g)(9)(ii)

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(g) LP-Gas System Installations on Commercial Vehicles.

	YES	NO
Are provisions incorporated in the assembly to hold the containers firmly in position and prevent their movement during transit in accordance with 1910.110(e)(4)(iii) of this checklist? (g)(9)(iii)		
Are containers mounted on a substantial support or base secured firmly to the vehicle chassis? (g)(9)(iv)		
Are precautions taken to insure that neither the container nor its support will extend below the frame? (g)(9)(iv)		
Piping – Including Pipe, Tubing, and Fittings. (g)(10)		
Are regulators connected directly to the container valve outlet or, as an alternate, are they mounted securely by means of a support bracket and connected to the container valve or valves with a listed high pressure flexible connector? (g)(10)(i)		
Are provisions made between the regulator outlet and the gas service lines by either a flexible connector or a tubing loop to provide for expansion, contraction, jarring, and vibration? (g)(10)(ii)		
Does piping, tubing, and fittings comply with the items under 1910.110(b)(8) of this checklist, except that the use of aluminum piping is prohibited? (g)(10)(iii)		
Does steel tubing have a minimum wall thickness of 0.049 inch? (g)(10)(iii)		
Is steel piping or tubing adequately protected against exterior corrosion? (g)(10)(iii)		
Are approved gas tubing fittings employed for making tubing connections? (g)(10)(iv)		
Is the fuel line firmly fastened in a protected location? (g)(10)(v)		
If fuel lines are under a vehicle and outside and below any insulation or false bottom, are fastenings such as to prevent abrasion or damage to the gasline due to vibration? (g)(10)(v)		
Where the fuel line passes through structural members or floors, is a rubber grommet or equivalent installed to prevent chafing? (g)(10)(v)		
Is the fuel line installed to enter the vehicle through the floor directly beneath or adjacent to the appliance which it serves? (g)(10)(vi)		
When a branch line is required, is the tee connection in the main fuel line and is it located under the floor and outside of the vehicle? (g)(10)(vi)		
Are all parts of the system assembly so designed and secured as to preclude such parts working loose during transit? (g)(10)(vii)		
Appliances. (g)(11)		
Are all LP-Gas appliances approved for use on commercial vehicles? (g)(11)(i)		
Are provisions made to dispose of the products of combustion to the outside, where the gas-fired heating appliance is used to protect the cargo? (g)(11)(ii)		
In the case of vehicles intended for human occupancy, are all gas-fired heating appliances, including water heaters, designed or installed to provide for complete separation of the combustion system from the atmosphere of the living space? (g)(11)(iii)		

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(g) LP-Gas System Installations on Commercial Vehicles.

	YES	NO
Is such appliance installed with the combustion air inlet assembly furnished as a component of the appliance and, also, with either: *(a)* The flue gas outlet assembly furnished as a component of the appliance, or *(b)* A listed roof jack if the appliance is listed for such use? (g)(11)(iii)		
Does the combustion air inlet assembly, flue gas outlet assembly, and roof jack extend to the outside atmosphere? (g)(11)(iii)		
Are provisions made to insure an adequate supply of outside air for combustion? (g)(11)(iv)		
Are all gas-fired heating appliances and water heaters equipped with an approved automatic device designed to shut off the flow of gas to the main burner, and to the pilot in the event the pilot flame is extinguished? (g)(11)(v)		
Are gas-fired appliances installed in the cargo space located so they are readily accessible? (g)(11)(vi)		
Are appliances constructed or protected to reduce to a minimum possible damage or impaired operation resulting from cargo shifting or handling? (g)(11)(vii)		
Are appliances inside the vehicle located so that a fire at an appliance will not block egress of persons therefrom? (g)(11)(viii)		
General Precautions. (g)(12)		
Are DOT containers marked, maintained, and requalified for use in accordance with the regulations of DOT? (g)(12)(i)		
Is the owner aware that he is responsible for the requalification of containers for continued service? (g)(12)(ii)		
Are the containers stamped with the date of requalification? (g)(12)(ii)		
When DOT cylinders are requalified by retesting, is such retest made in accordance with DOT regulations? (g)(12)(ii)		
Are containers prohibited from being charged with fuel unless they bear the proper markings of the code or specifications under which they were constructed, in addition to their water capacity? (g)(12)(iii)		
In the case of cylinders or portable containers filled by weight, is the container marked with its tareweight? (g)(12)(iii)		
Are DOT containers which have been involved in a fire not recharged until they have been requalified for service according to DOT regulations? (g)(12)(iv)		
Are American Petroleum Institute-American Society of Mechanical Engineers containers or ASME containers which have been involved in a fire, not recharged until they have been retested in accordance with the requirements for their original hydrostatic test and found to be suitable for continued service? (g)(12)(v)		
Are containers precluded from being charged without the consent of the owner? (g)(12)(vi)		
Is there a permanent caution plate provided on the appliance or adjacent to the container outside of any enclosure? (g)(12)(vii)		

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(g) LP-Gas System Installations on Commercial Vehicles.

YES NO

Does it include the word "Caution" or instructions embodying substantially the following:

(a) Be sure all appliance valves are closed before opening container valve.
(b) Connections at appliances, regulators, and containers must be checked periodically for leaks with soapy water or its equivalent.
(c) Never use a match or flame to check for leaks.
(d) Container valves must be closed when the equipment is not in use. (g)(12)(vii)

Charging of Containers. (g)(13)

Are containers charged as provided in the items under 1910.110(b)(12)? (g)(13)

Fire Extinguisher. (g)(14)

Are mobile cook-units provided with at least one approved portable fire extinguisher having a minimum rating of 8-B,C.? (g)(14)

(h) Liquefied Petroleum Gas Service Stations.

Application. (h)(1)

The following items apply to storage containers, and dispensing devices, and pertinent equipment in service stations where LP-Gas is stored and is dispensed into fuel tanks of motor vehicles. All requirements of items under 1910.110(b) apply to this section, unless otherwise noted. (h)(1)

Design Pressure and Classification of Storage Containers. (h)(2)

Is Table H-34 (see Appendix) used in the design and classification of storage containers? (h)(2)

Container Valves and Accessories. (h)(3)

Is the filling connection on the container fitted with one of the following:

(a) A combination back-pressure check and excess flow valve;
(b) One double or two single back-pressure valves;
(c) A positive shutoff valve, in connection with either:
  (1) An internal back-pressure valve, or
  (2) An internal excess flow valve? (h)(3)(i)

NOTE: In lieu of an excess flow valve, filling connections may be fitted with a quick-closing internal valve, which shall remain closed except during operating periods.

If a fusible plug is used, is its melting point less than 220°F.? (h)(3)(i)

Is a filling pipe inlet terminal not on the container fitted with a positive shutoff valve in conjunction with either:

(a) A back-pressure check valve, or
(b) An excess flow check valve? (h)(3)(ii)

Are all openings in the container except those listed below, equipped with approved excess flow check valves:

(a) Filling connections as provided in subdivision (i) of this subparagraph;
(b) Safety relief connections as provided in paragraph 1910.110(b)(7)(ii);
(c) Liquid-level gaging devices as provided in paragraphs 1910.110(b)(7)(iv) and (19)(iv) of this section;
(d) Pressure gage connections as provided in paragraph 1910.110(b)(7)(v) of this section? (h)(3)(iii)

1910.110 – STORAGE AND HANDLING OF LIQUEFIED PETROLEUM GASES
(h) Liquefied Petroleum Gas Service Stations.

YES NO

Are all container inlets and outlets except those listed below labeled to designate whether they connect with vapor or liquid portions of the tank:

(a) Safety relief valves;
(b) Liquid-level gaging devices;
(c) Pressure gages? (h)(3)(iv)

Is each storage container provided with a suitable pressure gage? (h)(3)(v)

Safety Relief Valves. (h)(4)

Are all safety relief devices installed as follows:

(a) Are they on the container and directly connected with the vapor space?
(b) Are safety relief valves and discharge piping protected against physical damage?
Is the outlet provided with loose-fitting rain caps?
Are return bends or restrictions prohibited from being in the discharge piping?
(c) If two or more safety relief valves having the same pressure settings discharge into a common discharge header, is the cross-sectional area of such header at least equal to the sum of the cross-sectional areas of the individual discharges?
(d) Is the discharge from any safety relief device prohibited from terminating in any building, or beneath any building? (h)(4)(i)

Are aboveground containers provided with safety relief valves as follows:

(a) Is the rate of discharge as required by the items under 1910.110(b)(10)(ii) of this checklist?
(b) Is the discharge from safety relief valves vented to the open air unobstructed and vertically upwards in such a manner as to prevent any impingement of escaping gas upon the container?
Are loose-fitting rain caps provided?
On a container having a water capacity greater than 2,000 gallons, does the discharge from the safety relief valves vent upwards from the container vertically to a point at least 7 feet above the container?
Are suitable provisions made so that any liquid or condensate that may accumulate inside of the relief valve or its discharge pipe does not render the valve inoperative?
If a drain is used, are means provided to protect the container, adjacent containers, piping, or equipment against impingement of flame resulting from ignition of the product escaping from the drain? (h)(4)(ii)

Are underground containers provided with the following safety relief valves:

(a) Is the discharge from safety relief valves piped vertically upward to a point at least 10 feet above the ground?
Are the discharge lines or pipes adequately supported and protected against physical damage?
(b) If liquid fuel is present during installation of containers, is the rate of discharge the same as required for aboveground containers?
Are underground containers not uncovered until emptied of liquid fuel? (h)(4)(iii)

Capacity of Liquid Containers. **(h)(5)**

Is the capacity of individual liquid storage containers limited to 30,000 gallons water capacity? **(h)(5)**

Installation of Storage Containers. **(h)(6)**

Does each storage container used exclusively in service station operations comply with the following table which specifies minimum distances to a building or groups of buildings? **(h)(6)(i)(a)**

	Minimum Distances	
Water capacity per container gallons	Aboveground and underground-feet	Between aboveground containers-feet
Up to 2,000 . . .	25	3
Over 2,000 . . .	50	5

NOTE: The above distances may be reduced to not less than 10 feet for service station buildings of other than wood frame construction.

Is all readily ignitable material, including weeds and long dry grass, removed within 10 feet of containers? **(h)(6)(i)(b)**

Is there a minimum separation between LP-Gas containers and flammable liquid tanks of at least 20 feet? **(h)(6)(i)(c)**

Is there a minimum separation between LP-Gas containers and the centerline of the dike of at least 10 feet? **(h)(6)(i)(c)**

Are LP-Gas containers that are located near flammable liquid containers protected against the flow or accumulation of flammable liquids by diking, diversion curbs, or grading? **(h)(6)(i)(d)**

Are LP-Gas containers prohibited from being located within diked areas for flammable liquid containers? **(h)(6)(i)(d)**

Is field welding of containers limited to only saddle plates or brackets, which were applied by the container manufacturer? **(h)(6)(i)(f)**

When permanently installed containers are interconnected, are provisions made to compensate for expansion, contraction, vibration, and settling of containers and interconnecting piping? **(h)(6)(i)(g)**

Where flexible connections are used, are they of the approved type and designed for a bursting pressure of not less than five times the vapor pressure of the product at 100°F.? **(h)(6)(i)(g)**

Is the use of nonmetallic hose prohibited for interconnecting such containers? **(h)(6)(i)(g)**

Where high water table or flood conditions may be encountered, is protection against container flotation provided? **(h)(6)(i)(h)**

Are aboveground containers installed in accordance with the following requirements:

(a) No requirements.
(b) Are containers protected by crash rails or guards to prevent physical damage, if their location warrants such protection?
Are vehicles being serviced at least 10 feet from the containers?
(c) Are container foundations of substantial masonry or other noncombustible material?

Are containers mounted on saddles which will permit expansion and contraction, and provide against the excessive concentration of stresses?
Is corrosion protection provided for tank-mounting areas?
Are structural metal container supports protected against fire?
On prefabricated storage and pump assemblies, mounted on a common base, with container bottom not more than 24 inches aboveground and whose water capacity is 2,000 gallons or less, is the piping connected to the storage and pump assembly sufficiently flexible to minimize the possibility of breakage or leakage in the event of failure of the container supports? **(h)(6)(ii)**

Are underground containers installed in accordance with the following:

(a) Are containers given a protective coating before being placed underground?
Is this coating equivalent to hot-dip galvanizing or to two coatings of red lead followed by a heavy coating of coal tar or asphalt?
In lowering the container into place, is care exercised to minimize abrasion or other damage to the coating?
Is damage to the coating repaired before backfilling?
(b) Are containers set on a firm foundation and surrounded with earth or sand firmly tamped in place?
Is backfill free of rocks or other abrasive materials?
(c) Is the container covered with at least 2 feet of earth?
Where ground conditions make compliance with this requirement impractical, is there equivalent protection against physical damage provided?
If the location is subjected to vehicular traffic, are containers protected by a concrete slab or other cover adequate to prevent the weight of a loaded vehicle imposing concentrated direct loads on the container shell? **(h)(6)(iii)**

Protection of Container Fittings. **(h)(7)**

Are valves, regulators, gages, and other container fittings protected against tampering and physical damage? **(h)(7)**

Transport Truck Unloading Point. **(h)(8)**

During unloading, is the transport truck prohibited from being parked on a public thoroughfare, and is it at least 5 feet from storage containers? **(h)(8)(i)**

Is the transport truck in such a position that the shutoff valves are readily accessible? **(h)(8)(i)**

Is the filling inlet terminal prohibited from being installed within a building, or within 10 feet of any building or driveway? **(h)(8)(ii)**

Is the filling inlet terminal protected against physical damage? **(h)(8)(ii)**

Piping, Valves, and Fittings. **(h)(9)**

Is piping, whether it be underground or aboveground, well supported and protected against physical damage and corrosion? **(h)(9)(i)**

Is piping that is laid beneath driveways installed to prevent physical damage by vehicles? **(h)(9)(ii)**

Is piping made up of wrought iron or steel, brass or copper pipe, or seamless copper, brass, or steel tubing, and is it suitable for a minimum pressure of 250 p.s.i.g.? **(h)(9)(iii)**

	YES	NO
Is the use of aluminum alloy piping or tubing prohibited? (h)(9)(iii)		
Are all shutoff valves (liquid or gas) suitable for liquefied petroleum gas service, and are they designed for not less than the maximum pressure to which they may be subjected? (h)(9)(iv)		
Do all valves which may be subjected to container pressure have a rated working pressure of at least 250 p.s.i.g.? (h)(9)(iv)		
Are all materials used for valve seats, packing, gaskets, diaphragms, etc., resistant to the action of LP-Gas? (h)(9)(v)		
Are fittings made of steel, malleable iron, or brass having a minimum working pressure of 250 p.s.i.g.? (h)(9)(vi)		
Are cast iron pipe fittings prohibited from being used? (h)(9)(vi)		
Is all piping tested after assembly and proved free from leaks at not less than normal operating pressures? (h)(9)(vii)		
Are provisions made for expansion, contraction, jarring, and vibration, and for settling? (h)(9)(viii)		
Pumps and Accessories. (h)(10)		
Are all pumps and accessory equipment suitable for LP-Gas service? (h)(10)		
Are all pumps and accessories designed for not less than the maximum pressure to which they may be subjected? (h)(10)		
Do accessories have a minimum rated working pressure of 250 p.s.i.g.? (h)(10)		
Are positive displacement pumps equipped with suitable pressure actuated bypass valves? (h)(10)		
Dispensing Devices. (h)(11)		
Are meters, vapor separators, valves, and fittings in the dispenser suitable for LP-Gas service? (h)(11)(i)		
Are they designed for a minimum working pressure of 250 p.s.i.g.? (h)(11)(i)		
Are provisions made for venting LP-Gas contained in a dispensing device to a safe location? (h)(11)(ii)		
Are pumps that are used to transfer LP-Gas equipped to allow control of the flow and to prevent leakage or accidental discharge? (h)(11)(iii)		
Are means provided outside the dispensing area to readily shut off the power in the event of fire or accident? (h)(11)(iii)		
Is a manual shutoff valve and an excess flow check valve installed downstream of the pump and ahead of the dispenser inlet? (h)(11)(iv)		
Is dispensing hose resistant to the action of LP-Gas in the liquid phase? (h)(11)(v)(a)		
Is it designed for a minimum bursting pressure of 1,250 p.s.i.g.? (h)(11)(v)(a)		
Is an excess flow check valve or automatic shutoff valve installed at the terminus of the liquid line at the point of attachment of the dispensing hose? (h)(11)(v)(b)		
Are LP-Gas dispensing devices located not less than 10 feet from aboveground storage containers greater than 2,000 gallons water capacity? (h)(11)(vi)(a)		

	YES	NO
Are the dispensing devices at least 20 feet from any building, basement, cellar, pit, or line of adjoining property which may be built upon, and not less than 10 feet from sidewalks, streets, or thoroughfares? (h)(11)(vi)(a)		
Are drains or blowoff lines prohibited from being directed into or in proximity to the sewer systems used for other purposes? (h)(11)(vi)(a)		
Are LP-Gas dispensing devices installed on a concrete foundation, or if part of a complete storage and dispensing assembly mounted on a common base, are they adequately protected from physical damage? (h)(11)(vi)(b)		
Are LP-Gas dispensing devices prohibited from being installed within a building? (h)(11)(vi)(c)		
If an LP-Gas dispensing device is located under a weather shelter or canopy, are there at least two sides open to the weather? (h)(11)(vi)(c)		
If the above two sides are adjacent to each other is the area properly ventilated? (h)(11)(vi)(c)		
Is the dispensing of LP-Gas into the fuel container of a vehicle performed only by a competent attendant who remains at the LP-Gas dispenser during the entire transfer operation? (h)(11)(vii)		
Additional Rules. (h)(12)		
Is smoking prohibited in the driveway of service stations, and in the dispensing areas or transport truck unloading areas? (h)(12)		
Are conspicuous signs prohibiting smoking posted within sight of the customer being served? (h)(12)		
Are the letters on such signs at least 4 inches high? (h)(12)		
Are the motors of all vehicles being fueled required to be shut off during the fueling operations? (h)(12)		
Electrical. (h)(13)		
Is all electrical equipment and installations in compliance with the items under 1910.110(b)(17) and (18) of this checklist? (h)(13)		
Fire Protection. (h)(14)		
Is each service station provided with at least one approved portable fire extinguisher having at least an 8-B,C. rating? (h)(14)		

(i) Scope.

Inapplicability. (i)(2)

This section **does not** apply to:

(i) Marine and pipeline terminals, natural gas processing plants, refineries, or tank farms other than those at industrial sites.
(ii) LP-Gas refrigerated storage systems.
(iii) LP-Gas when used with oxygen. The requirements of 1910.252 shall apply to such use.
(iv) LP-Gas when used in utility gas plants. The NFPA No. 59-1968, shall apply to such use.
(v) Low-pressure (not in excess of one-half pound per square inch or 14 inches water column) LP-Gas piping systems, and the installation and operation of residential and commercial appliances including their inlet connections, supplied through such systems. For such systems, NFPA 54-1969 shall apply. (i)(2)

YES NO

(a) General.

Scope. (a)(1)

The following items apply to the design, construction, location, installation, and operation of anhydrous ammonia systems including refrigerated ammonia storage systems. The following items **do not** apply to ammonia manufacturing plants, nor apply to refrigeration plants where ammonia is used solely as a refrigerant. (a)(1)

(b) Basic Rules.

The items in this checklist apply to all paragraphs of this section, unless otherwise noted. (b)

Approval of Equipment and Systems. (b)(1)

In the last regular mailing update in the Winter of 1974, reproductions were made of the changes to Approval of Equipment and Systems, issued by OSHA on February 8, 1973. These changes should be checked to determine the area in which your equipment falls relative to such approval of equipment and systems. (b)(1)

Requirements for Construction, Original Test and Requalification of Non-Refrigerated Containers. (b)(2)

Are containers that are used with the following systems constructed and tested in accordance with The Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels of the American Society of Mechanical Engineers-1968, except that construction under Table UW12 at a basic joint efficiency of under 80 percent is not authorized?

(1) Systems utilizing stationary non-refrigerated storage containers;
(2) Tank motor vehicles for the transportation of ammonia;
(3) Systems mounted on farm vehicles other than for the application of ammonia;
(4) Systems mounted on farm vehicles for the application of ammonia? (b)(2)(i)

NOTE: Containers built in accordance with the ASME Code **do not** have to comply with paragraphs UG125 to UG128 inclusive, and paragraphs US132 and UG133 of the Code. (b)(2)(ii)

Are containers exceeding 36 inches in diameter or 250 gallons water capacity constructed to comply with one or more of the following:

(a) Are containers stress relieved after fabrication in accordance with the Code, or
(b) Are cold-formed heads, when used, stress relieved, or
(c) Are hot-formed heads used? (b)(2)(iii)

Is all welding to the shell, head, or any other part of the container subject to internal pressure done in compliance with the Code? (b)(2)(iv)

Is other welding permitted only on saddle plates, lugs, or brackets attached to the container by the container manufacturer? (b)(2)(iv)

Do systems utilizing portable DOT containers comply with the construction and testing regulations in accordance with the DOT specifications? (b)(2)(v)

YES NO

Marking Non-Refrigerated Containers. (b)(3)

Are system nameplates, when required, permanently attached to the system so as to be readily accessible for inspection, and do such nameplates include marking as prescribed in subdivision (ii) of this subparagraph? (b)(3)(i)

Do the systems listed under item (2)(i) above have containers that are marked as specified in the following:

(a) With a notation "Anhydrous Ammonia"?
(b) With a marking identifying compliance with the rules of the Code under which the container is constructed?
(c) With a notation whether the system is designed for underground or aboveground installation, or both?
(d) With the name and address of the supplier of the system or the trade name of the system and with the date of fabrication?
(e) With the water capacity of the container in pounds at 60°F. or gallons, U.S. Standard?
(f) With the design pressure in pounds per square inch?
(g) With the wall thickness of the shell and heads?
(h) With markings indicating the maximum level to which the container may be filled with liquid anhydrous ammonia at temperatures between 20°F. and 130°F.?
Are markings made in increments of not more than 20°F.?

Exception: Except on containers provided with fixed level indicators, or containers that are filled with weight.
(i) With the total outside surface area of the container in square feet?
(j) Marking specified on the container shall be on the container itself or on a nameplate permanently attached to it. (b)(3)(ii)

Marking Refrigerated Containers. (b)(4)

Is each refrigerated container marked with a nameplate on the outer covering in an accessible place as specified in the following:

(i) With the notation, "Anhydrous Ammonia"?
(ii) With the name and address of the builder and date of fabrication?
(iii) With the water capacity of the container in gallons, U.S. Standard?
(iv) With the design pressure?
(v) With the minimum temperature in degrees Fahrenheit for which the container was designed?
(vi) The maximum allowable water level to which the container may be filled for test purposes?
(vii) With the density of the product in pounds per cubic foot for which the container was designed?
(viii) With the maximum level to which the container may be filled with liquid anhydrous ammonia? (b)(4)

Location of Containers. (b)(5)

Is consideration given to the physiological effects of ammonia as well as to adjacent fire hazards in selecting the location for a storage container? (b)(5)(i)

Are containers located outside of buildings or in buildings or sections thereof that are especially provided for this purpose? (b)(5)(i)

Are permanent storage containers located at least 50 feet from a dug well or other sources of potable water supply, unless the container is a part of a water-treatment installation? (b)(5)(ii)

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(b) Basic Rules.

	YES	NO
Are storage areas kept free of readily ignitable materials such as waste, weeds, and long dry grass? (b)(5)(v)		
Container Appurtenances. (b)(6)		
Are all appurtenances designed for not less than the maximum working pressure of that portion of the system on which they are installed? (b)(6)(i)		
Are all appurtenances fabricated from materials proved suitable for anhydrous ammonia service? (b)(6)(i)		
Are all connections to containers equipped with shutoff valves located as close to the container as practicable? (b)(6)(ii)		
Exception: Safety relief devices, gaging devices, or those fitted with No. 54 drill-size orifices.		
Where excess flow valves are equipped by this checklist, do such valves close automatically at the rated flows of vapor or liquid as specified by the manufacturer? (b)(6)(iii)		
Do connections and line including valves and fittings being protected by an excess flow valve have a greater capacity than the rated flow of the excess flow valve? (b)(6)(iii)		
Are excess flow and back pressure check valves located inside of the container or at a point outside as close as practicable to where the line enters the container? (b)(6)(vi)		
Where excess flow or back pressure check valves are outside the container, is the installation made in such a manner that any undue strain beyond the excess flow or back pressure check valve will not cause breakage between the container and the valve? (b)(6)(vi)		
Are excess flow valves designed with a bypass, not to exceed a No. 60 drill-size opening to allow equalization of pressures? (b)(6)(vii)		
Are all excess flow valves plainly and permanently marked with the name or trademark of the manufacturer, the catalog number, and the rated capacity? (b)(6)(viii)		
Piping, Tubing, and Fittings. (b)(7)		
Are all piping, tubing, and fittings made of material suitable for anhydrous ammonia service? (b)(7)(i)		
Is all piping, tubing, and fittings designed for a pressure not less than the maximum pressure to which they may be subjected in service? (b)(7)(ii)		
Does all refrigerated piping conform to the Refrigeration Piping Code, ANSI Standard B-31.5-1966 with addenda B31.1a-1968 as it applies to ammonia? (b)(7)(iii)		
Is all piping used on non-refrigerated systems at least ASTM A-53-69 Grade B Electric Resistance Welded and Electric Flash Welded Pipe or equal? (b)(7)(iv)		
Is such pipe at least schedule 40 when joints are welded, or welded and flanged? (b)(7)(iv)		
Is such pipe at least schedule 80 when joints are threaded? (b)(7)(iv)		
Are threaded connections prohibited from being back-welded? (b)(7)(iv)		

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(b) Basic Rules.

	YES	NO
Is the use of brass, copper, or galvanized steel pipe prohibited? (b)(7)(iv)		
Is tubing made of brass, copper, or other material subject to attack by ammonia prohibited? (b)(7)(v)		
Is the use of cast iron fittings prohibited for ammonia service? (b)(7)(vi)		
Are joint compounds resistant to ammonia? (b)(7)(vii)		
Hose Specifications. (b)(8)		
Does hose used in ammonia service conform to the joint Agricultural Ammonia Institute – Rubber Manufacturers Association Specifications for Anhydrous Ammonia Hose? (b)(8)(i)		
Is hose subject to container pressure designed for a minimum working pressure of 350 p.s.i.g., and a minimum burst pressure of 1,750 p.s.i.g.? (b)(8)(ii)		
Are hose assemblies, when made up, capable of withstanding a test pressure of 500 p.s.i.g.? (b)(8)(ii)		
Are hose and hose connections located on the low-pressure side of flow control or pressure-reducing valves designed for a bursting pressure of not less than five times the pressure setting of the safety relief devices protecting that portion of the system, but not less than 125 p.s.i.g.? (b)(8)(iii)		
Are all connections so designed and constructed that there will be no leakage when connected? (b)(8)(iii)		
Where "wet" hose is used for transferring liquid from one container to another, is such hose equipped with approved shutoff valves at the discharge end? (b)(8)(iv)		
Are provisions made to prevent excessive pressure in the hose? (b)(8)(iv)		
Is all hose one-half inch outside diameter or larger, used for the transfer of anhydrous ammonia, marked at 5-foot intervals with the following information: ("Anhydrous Ammonia") xxx p.s.i.g. (maximum working pressure), manufacturer's name or trademark, year of manufacture. (b)(8)(v)		
In lieu of the above requirement, is the same information contained on a nameplate permanently attached to the hose? (b)(8)(v)		
Safety Relief Devices. (b)(9)		
Is each container as listed under (2)(i) of this checklist provided with one or more safety relief valves of the spring-loaded or equivalent type? (b)(9)(i)		
Is the discharge from safety-relief valves vented away from the container upward and unobstructed to the atmosphere? (b)(9)(i)		
Are all relief valve discharge openings equipped with suitable rain caps that will allow free discharge of the vapor and prevent entrance of water? (b)(9)(i)		
Are provisions made for draining condensate which may accumulate? (b)(9)(i)		
Is Table H-36 (see Appendix) used to determine the required rate of discharge? (b)(9)(i)		
Are container safety relief valves set to "start-to-discharge" as follows, with relation to the design pressure of the container? (b)(9)(ii)		

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(b) Basic Rules.

YES NO

Containers	Minimum (percent)	Maximum (percent)
ASME-U-68, U-69	110	125
ASME-U-200, U-201	95	100
ASME 1959, 1956, 1952, or 1962	95	100
API-ASME	95	100
U.S. Coast Guard	95	100

Are safety relief devices used in systems listed under item 1910.111(b)(2)(i) constructed to discharge at not less than the rates required in Table H-36 (see Appendix) before the pressure is in excess of 120 percent of the maximum permitted "start-to-discharge" pressure setting of the device? **(b)(9)(iii)**

Are safety relief valves so arranged that the possibility of tampering will be minimized? **(b)(9)(iv)**

Are relief valves provided with means for sealing the adjustment? **(b)(9)(iv)**

Are shutoff valves prohibited from being installed between the safety relief valves and the container, with the exception, that a shutoff valve may be used where the arrangement of this valve is such as always to afford full required capacity flow through the relief valves? **(b)(9)(v)**

Do safety relief valves have direct communication with the vapor space of the container? **(b)(9)(vi)**

On systems listed under (2)(i) of this checklist, is each container safety relief valve plainly and permanently marked with the symbol "NH_3" or "AA", with the pressure in pounds-per-square-inch gage at which the valve is set to "start-to-discharge"? **(b)(9)(vii)**

Is each such safety relief valve marked with the actual rate of discharge of the valve at its full open position in cubic feet per minute of air at 60°F. and atmospheric pressure, and with the manufacturer's name and catalog number? **(b)(9)(vii)**

Are precautions taken to insure that the flow capacity of the relief valve will not be restricted by any connection to it on either the upstream or downstream side? **(b)(9)(viii)**

Is a hydrostatic relief valve installed between each pair of valves in the liquid ammonia piping or hose where liquid may be trapped? **(b)(9)(ix)**

General. **(b)(10)**

Do all stationary storage installations have at least two suitable gas masks in readily accessible locations? **(b)(10)(ii)**

For protection in concentrated ammonia atmospheres, is self-contained breathing air apparatus available? **(b)(10)(ii)**

On stationary storage installations is there an easily accessible shower or a 50-gallon drum of water? **(b)(10)(iii)**

Is each vehicle transporting ammonia in bulk, except farm applicator vehicles, equipped with a container of at least 5 gallons of water, and is it equipped with a full face mask? **(b)(10)(iv)**

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(b) Basic Rules.

YES NO

Charging of Containers. **(b)(11)**

Are the filling densities for containers that are not refrigerated limited to the following: **(b)(11)(i)**

Type of Container	% by Wt.	% by Vol.
Aboveground-Uninsulated	56	82
Aboveground-Uninsulated	....	87.5
Aboveground-Insulated	57	83.5
Underground-Uninsulated	58	85
DOT-In Accord with DOT regulations.		

On aboveground uninsulated containers that can be charged 87.5 percent by volume, is the temperature of the anhydrous ammonia being charged determined to be not lower than 30°F.? **(b)(11)(ii)**

On aboveground uninsulated containers that can be charged 87.5 percent by volume, are provisions made to stop the charging at the first indication of frost or ice formation on its outside surface, and are provisions also made not to resume such loading until such frost or ice has disappeared? **(b)(11)(ii)**

Transfer of Liquids. **(b)(12)**

Are precautions taken to insure that anhydrous ammonia will always be at a temperature suitable for the material of construction and the design of the receiving container? **(b)(12)(i)**

Are precautions taken to insure that an attendant is in continous presence in the vicinity of the operation when ammonia is being transferred? **(b)(12)(ii)**

Has the owner of the containers approved them to be charged or used? **(b)(12)(iii)**

Are precautions taken to insure that containers are gaged and charged only in the open atmosphere, or in buildings or areas provided for that purpose? **(b)(12)(iv)**

Are pumps used for transferring ammonia manufactured for that purpose, and do they comply with the following items?

(a) Are pumps designed for at least 250 p.s.i.g. working pressure?
(b) Do positive displacement pumps have installed off the discharged port, a constant differential relief valve discharging into the suction port of the pump, through a line of sufficient size to carry the full capacity of the pump at relief valve setting?

Is the setting and installation of the relief valve according to the pump manufacturer's recommendations?
(c) Is a pressure gage graduated from 0 to 400 p.s.i. installed on the discharge side of the pump, before the relief valve line?
(d) Are shutoff valves located in plant piping as close as practical to pump connections? **(b)(12)(v)**

Are compressors that are used for transferring or refrigerating ammonia recommended for ammonia service by the manufacturer? **(b)(12)(vi)**

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(b) Basic Rules.

YES NO

Do they comply with the following items:

(a) Are compressors designed for at least 250 p.s.i.g. working pressure?
(b) Does plant piping contain shutoff valves located as close as practical to compressor connections?
(c) Is a relief valve large enough to discharge the full capacity of the compressor connected to the discharge before any shutoff valve?
(d) Do compressors have pressure gages at suction and discharge graduated to at least one and one-half times the maximum pressure that can be developed?
(e) Are adequate means provided on the compressor suction to minimize the entry of liquid into the compressor?

Are loading and unloading systems protected by suitable devices to prevent emptying of the storage container being loaded or unloaded in the event of severance of the hose? (b)(12)(vii)

Are backflow check valves or properly sized excess flow valves installed where necessary to provide such protection? (b)(12)(vii)

Tank Car Unloading Points and Operations. (b)(13)

Do provisions for unloading tank cars conform to the applicable recommendations contained in the DOT regulations? (b)(13)(i)

Are unloading operations performed by reliable persons properly instructed and given the authority to monitor careful compliance with all applicable procedures? (b)(13)(ii)

Are caution signs placed on the track or car as to give necessary warnings to persons approaching the car from open end or the ends of siding? (b)(13)(iii)

Are such signs left up until after the car is unloaded and disconnected from discharge connections? (b)(13)(iii)

Are such signs at least 12 by 15 inches in size and made of metal or other suitable material? (b)(13)(iii)

Do such signs contain the words "STOP–Tank Car Connected" or "STOP–Men at Work"? (b)(13)(iii)

Are the letters in the word "STOP" at least 4 inches high, and are the letters in other words at least 2 inches high? (b)(13)(iii)

Is the track of a tank car siding substantially level? (b)(13)(iv)

Are brakes set and wheels blocked on all cars being unloaded? (b)(13)(v)

Liquid-Level Gaging Device. (b)(14)

Is each container not filled by weight equipped with an approved liquid-level gaging device? (b)(14)(i)

Is a thermometer well provided in all containers not utilizing a fixed liquid-level gaging device? (b)(14)(i)

Are all gaging devices arranged so that the maximum liquid level to which the container is filled is readily determined? (b)(14)(ii)

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(b) Basic Rules.

YES NO

Are gaging devices that require bleeding of the product to the atmosphere, designed so that the maximum opening of the bleed valve is not larger than No. 54 drill size, unless provided with an excess flow valve? (b)(14)(iii)

Do gaging devices have a design pressure equal to or greater than the design pressure of the container on which they are installed? (b)(14)(iv)

Are fixed tube liquid-level gages designed and installed to indicate that level at which the container is filled to 85 percent of its water capacity in gallons? (b)(14)(v)

Are gage glasses of the columnar type restricted to stationary storage installations? (b)(14)(vi)

Are gage glasses equipped with shutoff valves having metallic handwheels, with excess-flow valves? (b)(14)(vi)

Are gage glasses equipped with extra heavy glass adequately protected with a metal housing applied by the gage manufacturer? (b)(14)(vi)

Are gage glasses shielded against the direct rays of the sun? (b)(14)(vi)

Standard Removed by OSHA. (b)(15)

Electrical Equipment and Wiring. (b)(16)

Is electrical equipment and wiring for use in ammonia installations of general purpose, or weather resistant? (b)(16)(i)

Are electrical systems installed and maintained in accordance with the items in subpart S of this checklist? (b)(16)(ii)

(c) Systems Utilizing Stationary, Non-Refrigerated Storage Containers.

The following items apply to stationary, non-refrigerated storage installations utilizing containers other than those covered in items under paragraph (e) of this section. Paragraph 1910.111(b) also applies unless otherwise noted in the following items: (c)

Design Pressure and Construction of Containers. (c)(1)

Is the minimum design pressure for non-refrigerated containers at least 250 p.s.i.g.? (c)(1)

Container Valves and Accessories, Filling and Discharge Connections. (c)(2)

Is each filling connection provided with one of the following:

(a) With a combination back-pressure check valve and excess-flow valve;
(b) One double or two single back-pressure check valves;
(c) A positive shutoff valve in conjunction with either an internal back-pressure check valve or an internal excess flow valve? (c)(2)(i)

Are all liquid and vapor connections to containers equipped with excess-flow valves? (c)(2)(ii)

Exceptions: Filling pipes, safety relief connections, and liquid-level gaging and pressure gage connections provided with orifices not larger than No. 54 drill size.

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(c) Systems Utilizing Stationary, Non-Refrigerated Storage Containers.

YES NO

Is each storage container provided with a pressure gage that is designed for use in ammonia service, and is graduated from 0 to 400 p.s.i.? (c)(2)(iii)

Are all containers equipped with vapor return valves? (c)(2)(iv)

Safety Relief Devices. (c)(3)

Is every container provided with one or more safety relief valves that comply with the items under 1910.110(b)(9) of this checklist? (c)(3)(i)

If the rate of discharge of spring-loaded safety relief valves installed on underground containers is reduced to a minimum of 30 percent of the rate of discharge specified in Table H-36 (see Appendix), are containers so protected that they will not be uncovered after installation until the liquid ammonia has been removed? (c)(3)(ii)

Are containers which may contain liquid ammonia before being installed underground and before being completely covered with earth, considered to be aboveground containers when determining the rate of discharge requirements of the safety relief valves? (c)(3)(ii)

On underground installations where there is a probability of the manhole or housing becoming flooded, is the discharge from vent lines located above the high water level? (c)(3)(iii)

Is the area of such openings equalling or exceeding combined discharge areas of safety relief valves and vent lines which discharge their content into the manhole housing? (c)(3)(iii)

When vent pipes are used, are precautions taken to insure they are not restricted or of smaller diameter than the relief valve outlet connection? (c)(3)(iv)

If vent pipes from two or more safety relief devices located on the same unit, or similar lines from two or more different units, are run into a common discharge header, are provisions made to insure that the capacity of such header is at least equal to the sum of the capacities of the individual discharge lines? (c)(3)(v)

Reinstallation of Containers. (c)(4)

Are provisions made to insure that containers once installed underground are not later reinstalled aboveground or underground, unless they have successfully withstood hydrostatic pressure retests at the pressure specified for the original hydrostatic test, as required by the code under which constructed and show no evidence of serious corrosion? (c)(4)(i)

When containers are installed aboveground, are safety devices or gaging devices made to comply with paragraph 1910.111(b)(9) of this checklist and this subparagraph? (c)(4)(ii)

Installation of Storage Containers. (c)(5)

Are containers installed aboveground except for "skid tanks", provided with substantial concrete or masonry supports, or structural steel supports on firm concrete or masonry foundations? (c)(5)(i)

Do all such foundations extend below the frost line? (c)(5)(i)

Are horizontal aboveground containers so mounted on foundations as to permit expansion and contraction? (c)(5)(ii)

Is every container so supported as to prevent the concentration of excessive loads on the supporting portion of the shell? (c)(5)(ii)

Is that portion of the container in contact with foundations or saddles protected against corrosion? (c)(5)(ii)

Are containers that are installed underground so placed that the top of the container is below the frost line, and in no case less than 2 feet below the surface of the ground? (c)(5)(iii)

Should ground conditions make compliance with these requirements impracticable, is the installation made otherwise to prevent physical damage? (c)(5)(iii)

If there is a possibility of the container floating, are containers securely anchored or weighted? (c)(5)(iii)

Are underground containers set on a firm foundation and surrounded with earth or sand well tamped in place? (c)(5)(iv)

Are containers given a corrosion resisting protective coating prior to being placed underground? (c)(5)(iv)

Are containers thus coated lowered into place to prevent abrasion or other damage to the coating? (c)(5)(iv)

Are "skid tanks" designed and constructed with a minimum design pressure for non-refrigerated containers of at least 250 p.s.i.g.? (c)(5)(v)

Is secure anchorage or adequate pier height provided against container flotation wherever sufficiently high flood water might occur? (c)(5)(vi)

Is the distance between underground containers of over 2,000 gallons capacity at least 5 feet? (c)(5)(vii)

Protection of Appurtenances. (c)(6)

Are valves, regulating, gaging, and other appurtenances protected against tampering and physical damage? (c)(6)(i)

Are such appurtenances also protected during transit of containers? (c)(6)(i)

Are all connections to underground containers located within a dome, housing, or manhole and with access thereto by means of a substantial cover? (c)(6)(ii)

Damage From Vehicles. (c)(7)

Are precautions taken to prevent damage to ammonia systems from vehicles? (c)(7)

(d) Refrigerated Storage Systems.

The following items apply to systems utilizing containers with the storage of anhydrous ammonia under refrigerated conditions. All items under 1910.111(b) of this checklist apply to this paragraph unless otherwise noted. (d)

Design of Containers. (d)(1)

Is the design temperature of the container the minimum temperature to which the container will be refrigerated? (d)(1)(i)

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(d) Refrigerated Storage Systems.

	YES	NO
Are containers with a design pressure exceeding 15 p.s.i.g. constructed in accordance with the items contained in 1910.111(b)(2) of this checklist? (d)(1)(ii)		
Are the materials for these containers selected from those listed in API Standard 620, and Tables 2.02, R2.2, R2.2(a), R2.2.1, or R2.3? (d)(1)(ii)		
Are containers with a design pressure of less than 15 p.s.i.g. constructed in accordance with the applicable requirements of API Standard 620 including its Appendix R? (d)(1)(iii)		
When austenitic steels or nonferrous materials are used, is the Code used as a guide in the selection of materials for use at the design temperature? (d)(1)(iv)		
Is the filling density for refrigerated storage containers such that the container will not be liquid full at a liquid temperature corresponding to the vapor pressure at the "start-to-discharge" pressure setting of the safety relief valve? (d)(1)(v)		
Installation of Refrigerated Storage Containers. (d)(2)		
Are containers supported on suitable noncombustible foundations designed to accommodate the type of container being used? (d)(2)(i)		
Is adequate protection against flotation or other water damage provided wherever high flood water might occur? (d)(2)(ii)		
Are containers for product storage at less than 32°F. supported in such a way, or is heat supplied to prevent the effects of freezing and consequent frost heaving? (d)(2)(iii)		
Shutoff Valves. (d)(3)		
When operating conditions make it advisable, is a check valve installed on the fill connection, and a remotely operated shutoff valve on other connections located below the maximum liquid level? (d)(3)		
Safety Relief Devices. (d)(4)		
Are safety relief valves set with a "start-to-discharge" at a pressure not in excess of the design pressure of the container? (d)(4)(i)		
Do safety relief valves have a total relieving capacity sufficient to prevent a maximum pressure in the container of more than 120 percent of the design pressure? (d)(4)(i)		
Are relief valves for refrigerated storage of the self-contained spring-loaded, weight-loaded, or self-contained pilot-operated type? (d)(4)(i)		
Is the total relieving capacity the larger of: *(a)* Possible refrigeration system upset such as (1) cooling water failure, (2) power failure, (3) instrument air or instrument failure, (4) mechanical failure of any equipment, (5) excessive pumping rates? *(b)* Fire exposure determined in accordance with compressed Gas Association Pamphlet S-1, Part 3, Safety Relief Device Standards for Compressed Gas Storage Containers, 1959? NOTE: "A" shall be the total exposed surface area in square feet up to 25 foot above grade or to the equator of the storage container if it is a sphere, whichever is greater.		

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(d) Refrigerated Storage Systems.

	YES	NO
If the relieving capacity required for fire exposure is greater than that required by the items under (a) above, is the additional capacity provided by weak roof to shell seams in containers operating at essentially atmospheric pressure and having an inherently weak roof-to-shell seam? NOTE: The weak roof-to-shell seam is not to be considered as providing any of the capacity required in the items under (a) above. (d)(4)(ii)		
If vent lines are installed to conduct the vapors from the relief valve, are precautions taken to insure that the back pressure under full relieving conditions will not exceed 50 percent of the "start-to-discharge" pressure for pressure balanced valves, or 10 percent of the "start-to-discharge" pressure for conventional valves? (d)(4)(iii)		
Are vent lines installed to prevent accumulation of liquid in the lines? (d)(4)(iii)		
Does the valve or valve installation have weather protection provided? (d)(4)(iv)		
Is atmospheric storage provided with vacuum breakers? (d)(4)(v) NOTE: Ammonia gas, nitrogen, methane, or other inert gases can be used to provide a pad.		
Protection of Container Appurtenances. (d)(5)		
Are appurtenances protected against tampering and physical damage? (d)(5)		
Reinstallation of Refrigerated Storage Containers. (d)(6)		
Are containers that require field fabrication, when moved and reinstalled, reconstructed and reinspected in complete accordance with the requirements under which they were constructed? (d)(6)		
Are such containers subjected to a pressure retest, and if rerating is necessary, is the rerating accomplished in accordance with applicable requirements? (d)(6)		
Damage From Vehicles. (d)(7)		
Are precautions taken to insure that containers will not be damaged by vehicles? (d)(7)		
Refrigeration Load and Equipment. (d)(8)		
Is the total refrigeration load computed as the sum of the following: *(a)* Is the load imposed by heat flow into the container caused by the temperature differential between design ambient temperature and storage temperature? *(b)* Is the load imposed by heat flow into the container caused by maximum sun radiation? *(c)* Is the maximum load imposed by filling the container with ammonia warmer than the design storage temperature? (d)(8)(i)		
Compressors. (d)(9)		
Is there a minimum of two compressors provided, either of which must be of sufficient size to handle the loads listed in the items in (8)(i)(a) and (b) above? (d)(9)(i)		
Where two or more compressors are provided is there minimum standby equipment equal to the largest normally operating equipment installed? (d)(9)(i)		

1910.111 – STORAGE AND HANDLING OF ANHYDROUS AMMONIA
(d) Refrigerated Storage Systems.

	YES	NO
Are compressors so sized to operate with a suction pressure at least 10 percent below the minimum setting of the safety valves on the storage container, and are they capable of withstanding a suction pressure at least equal to 120 percent of the design pressure of the container? (d)(9)(ii)		
Compressor Drives. (d)(10) Does each compressor have its individual driving unit? (d)(10)(i)		
Are emergency sources of power of sufficient capacity available to handle the loads listed in items (8)(i)(a) and (b) above? (d)(10)(ii) **Exception:** Unless facilities are available to safely dispose of vented vapors while the refrigeration system is not operating.		
Automatic Control Equipment. (d)(11) Is the refrigeration system arranged with suitable controls to govern the compressor operation in accordance with the load as evidenced by the pressure in the containers? (d)(11)(i)		
Is an emergency alarm system installed to function in the event the pressure in the containers rises to the maximum allowable operating pressure? (d)(11)(ii)		
Is an emergency alarm and shutoff located in the condenser system to respond to excess discharge pressure caused by failure of the cooling medium? (d)(11)(iii)		
Are all automatic controls installed in such a manner as to preclude operation of alternate compressors unless the controls will function with the alternate compressors? (d)(11)(iv)		
Separators for Compressors. (d)(12) Is an entrainment separator of suitable size and design pressure installed in the compressor suction line of lubricated compression? (d)(12)(i)		
Is the separator equipped with a drain and gaging device? (d)(12)(i)		
Condensers. (d)(13) Is the condenser designed for at least 250 p.s.i.g.? (d)(13)		
Are provisions made for purging noncondensibles either manually or automatically? (d)(13)		
Receiver and Liquid Drain. (d)(14) Is the receiver provided with a liquid-level control to discharge the liquid ammonia to storage? (d)(14)		
Is the receiver designed for at least 250 p.s.i.g. and is it equipped with the necessary connections, safety valves, and gaging devices? (d)(14)		
Insulation. (d)(15) Are refrigerated containers and pipelines that are insulated covered with a material of suitable quality and thickness for the temperatures encountered? (d)(15)		
Is insulation suitably supported and protected against the weather? (d)(15)		

1910.111 – STORAGE AND HANDLING OF ANHYDROUS AMMONIA
(d) Refrigerated Storage Systems.

	YES	NO
Is weatherproofing of a type which will not support flame propagation? (d)(15)		
(e) Systems Utilizing Portable DOT Containers. *Conformance.* (e)(1) Do cylinders comply with DOT specifications and are they maintained, filled, packaged, marked, labeled, and shipped to comply with 49 CFR Chapter I and Marking Portable Compressed Gas Containers to Identify the Material Contained, ANSI Z48.1-1954 (R1970)? (e)(1)		
Storage. (e)(2) Are cylinders stored in an area free from ignitable debris and in such a manner as to prevent external corrosion? (e)(2)		
Heat Protection. (e)(3) Are cylinders protected from heat sources such as radiant flame and steampipes? (e)(3)		
Is the application of heat directly to cylinders to raise the pressure prohibited? (e)(3)		
Protection. (e)(4) Are cylinders stored in such manner as to protect them from moving vehicles or external damage? (e)(4)		
Valve Cap. (e)(5) Are cylinders that are designed to have a valve protection cap have such a cap securely in place when the cylinder is not in service? (e)(5)		
(f) Tank Motor Vehicles for the Transportation of Ammonia. The following items apply to containers and pertinent equipment mounted on tank motor vehicles, including semitrailers and full trailers used for the transportation of ammonia. The following items **do not** apply to farm vehicles. The items under 1910.111(b) apply to the transportation of ammonia unless otherwise noted.		
Design Pressure and Construction of Containers. (f)(2) Is the minimum design pressure for containers that specified in the regulations of the DOT? (f)(2)(i)		
Is the shell or head thickness of any container not less than three-sixteenth inch? (f)(2)(ii)		
Are all container openings, except safety relief valves, liquid-level gaging devices, and pressure gages labeled to designate whether they communicate with liquid or vapor space? (f)(2)(iii)		
Container Appurtenances. (f)(3) Are all appurtenances protected against physical damage? (f)(3)(i)		
Are all connections to containers, except filling connections, safety relief devices, and liquid-level and pressure gage connections, provided with suitable automatic excess flow valves, or with quick-closing internal valves which will remain closed except during delivery operations? (f)(3)(ii)		
If the control mechanism for such valves is provided with a secondary control remote from the delivery connections, is such control mechanism provided with a fusible section (melting point 208°F. to 220°F.) which will permit the internal valve to close automatically in case of fire? (f)(3)(ii)		

1910.111 – STORAGE AND HANDLING OF ANHYDROUS AMMONIA
(f) Tank Motor Vehicles for the Transportation of Ammonia.

	YES	NO
Are filling connections provided with automatic back-pressure check valves, excess flow valves, or quick-closing internal valves? (f)(3)(iii)		
Are all containers equipped for spray loading or with an approved vapor return valve of adequate capacity? (f)(3)(iv)		
Piping and Fittings. (f)(4)		
Is all piping, tubing, and fittings securely mounted and protected against damage? (f)(4)(i)		
Are means provided to protect hoses while the vehicle is in motion? (f)(4)(i)		
Do fittings comply with the items under 1910.111(b)(6) of this checklist? (f)(4)(ii)		
Is all pipe at least Schedule 80? (f)(4)(ii)		
Safety Relief Devices. (f)(5)		
Is the discharge from safety relief valves vented away from the container upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container? (f)(5)(i)		
Are loose-fitting rain caps provided and used? (f)(5)(i)		
Are precautions taken to insure that the size of discharge lines from safety valves will not be smaller than the nominal size of the safety relief valve outlet connection? (f)(5)(i)		
Are suitable provisions made for draining condensate which may accumulate in the discharge pipe? (f)(5)(i)		
Are precautions taken to insure that any portion of liquid ammonia piping which at any time may be closed at both ends is provided with a hydrostatic relief valve? (f)(5)(ii)		
Transfer of Liquids. (f)(6)		
Is the content of tank motor vehicle containers determined by weight, by a suitable liquid-level gaging device, or other approved methods? (f)(6)(i)		
If the content of a container is determined by liquid-level measurement, is the container equipped with a thermometer well so that the internal liquid temperature can be easily determined? (f)(6)(i)		
Are precautions taken to insure that this volume when converted to weight will not exceed the filling density specified by the DOT? (f)(6)(i)		
Are pumps, except a constant speed centrifugal pump, equipped with a suitable pressure actuated bypass valve that will permit flow from discharge to suction when the discharge pressure rises above a predetermined point? (f)(6)(ii)		
Is the pump discharge equipped with a spring-loaded safety relief valve set at a pressure not more than 135 percent of the setting of the bypass valve or more than 400 p.s.i.g., whichever is larger? (f)(6)(ii)		
Are compressors equipped with manually operated shutoff valves on both suction and discharge containers? (f)(6)(iii)		
Are pressure gages of bourdon-tube type installed on the suction and discharge of the compressor before the shutoff valves? (f)(6)(iii)		
Are precautions taken to insure that the compressor will not be operated if either pressure gage is removed or is inoperative? (f)(6)(iii)		

1910.111 – STORAGE AND HANDLING OF ANHYDROUS AMMONIA
(f) Tank Motor Vehicles for the Transportation of Ammonia.

	YES	NO
Is a spring-loaded safety relief valve, capable of discharging to the atmosphere the full flow of gas from the compressor at a pressure not exceeding 300 p.s.i.g., connected between the compressor discharge and the discharge shutoff valve? (f)(6)(iii)		
Are valve functions clearly and legibly identified by metal tags or nameplates permanently affixed to each valve? (f)(6)(iv)		
Full Trailers and Semitrailers. (f)(7)		
Are all full trailers firmly and securely attached to the vehicle by drawing them by means of suitable drawbars supplemented by a safety chain (or chains) or safety cables? (f)(7)(i)		
Does every full trailer or semitrailer have a reliable system of brakes? (f)(7)(ii)		
Are adequate provisions made to operate the system of brakes from the driver's seat? (f)(7)(ii)		
Is every full trailer equipped with self-energizing brakes? (f)(7)(iii)		
Are full trailers so designed that the towed vehicle will follow substantially in the path of the towing vehicle without whipping or swerving from side to side? (f)(7)(iv)		
If a fifth wheel is employed is it ruggedly designed, securely fastened to both units, and equipped with a positive locking mechanism which will prevent separation of the two units except by manual release? (f)(7)(v)		
Protection Against Collision. (f)(8)		
Is each motor tank vehicle provided with properly attached bumpers or chassis extension arranged to protect the tank, piping, valves, and fittings from physical damage? (f)(8)		
Chock Blocks. (f)(9)		
Are there at least two chock blocks provided? (f)(9)		
Are these blocks placed to prevent rolling of the vehicle whenever it is parked during loading and unloading operations? (f)(9)		
Portable Tank Containers (skid tanks). (f)(10)		
Do portable tank containers (skid tanks) used for farm storage comply with paragraph 1910.111(c)(1) of this checklist? (f)(10)		
When portable tanks are permanently mounted on tank motor vehicles for the transportation of ammonia, do they comply with the applicable requirements of this paragraph? (f)(10)		
(g) Systems Mounted on Farm Vehicles Other Than for the Application of Ammonia.		
Application. (g)(1)		
The following items apply to containers of 1,200 gallons capacity or less and pertinent equipment mounted on farm vehicles and used for other than the application of ammonia to the soil. The items in this checklist under 1910.111(b) apply to this section unless otherwise noted. (g)(1)		
Design Pressure and Classification of Containers. (g)(2)		
Is the minimum design pressure for containers at least 250 p.s.i.g.? (g)(2)(i)		
Is the shell or head thickness of any container not less than three-sixteenths of an inch? (g)(2)(ii)		

1910.111 – STORAGE AND HANDLING OF ANHYDROUS AMMONIA

(g) Systems Mounted on Farm Vehicles Other Than for the Application of Ammonia.

YES NO

Mounting Containers. (g)(3)

Are suitable "stop" or "stops" mounted on the vehicle or on the container in such a way that the container will not be dislodged from its mounting due to the vehicle coming to a sudden stop? (g)(3)(i)

Is back slippage also prevented by proper methods? (g)(3)(i)

Are suitable "hold down" devices provided which will anchor the container to the vehicle at one or more places on each side of the container? (g)(3)(ii)

Is care taken to insure that the weight is distributed evenly over both axles when containers are mounted on four-wheel trailers? (g)(3)(iii)

When the cradle and tanks are not welded together, is suitable material used between them to eliminate metal-to-metal friction? (g)(3)(iv)

Container Appurtenances. (g)(4)

Are all containers equipped with a fixed liquid-level gage? (g)(4)(i)

Are all containers with a capacity exceeding 250 gallons equipped with a pressure gage having a dial graduated from 0-400 p.s.i.? (g)(4)(ii)

Is the filling connection fitted with one of the following: (a) combination back-pressure check valve and excess flow valve; (b) one double or two single back-pressure check valves; or (c) a positive shutoff valve in conjunction with either an internal back-pressure check valve or an internal excess flow valve? (g)(4)(iii)

Are all containers with a capacity exceeding 250 gallons equipped for spray loading or with an approved vapor return valve? (g)(4)(iv)

Are all vapor and liquid connections equipped with approved excess flow valves or with quick-closing internal valves which, except during operating periods, shall remain closed? (g)(4)(v)

Exceptions: Safety relief valves and those specifically exempted by 1910.111(b)(6)(v).

Are fittings adequately protected from damage by a metal box or cylinder with open top securely fastened to the container by well braced or rigid guards welded to the container on both sides of the fittings or by a metal dome? (g)(4)(vi)

Is the relief valve properly vented through the dome? (g)(4)(vi)

On containers that have a liquid withdrawal line installed in the bottom, are precautions taken to insure that the connections thereto, including the hose, will not be lower than the lowest horizontal edge of the vehicle axle? (g)(4)(vii)

Are provisions made to secure both ends of the hose while in transit? (g)(4)(viii)

Marking the Container. (g)(5)

Are provisions made to provide signs on each side and on the rear end of the container with the words "Caution-Ammonia" with letters at least 4 inches high, or is the container marked in accordance with DOT regulations? (g)(5)

1910.111 – STORAGE AND HANDLING OF ANHYDROUS AMMONIA

(g) Systems Mounted on Farm Vehicles Other Than for the Application of Ammonia.

YES NO

Farm Vehicles. (g)(6)

Do farm vehicles conform with all State regulations? (g)(6)(i)

Are all trailers securely attached to the vehicle drawing them by means of drawbars supplemented by suitable safety chains? (g)(6)(ii)

Are trailers so constructed that they will follow substantially in the path of the towing vehicle without whipping or swerving dangerously from side to side? (g)(6)(iii)

Do all vehicles carry a can containing 5 gallons or more of water? (g)(6)(iv)

(h) Systems Mounted on Farm Vehicles for the Application of Ammonia.

The following items apply to systems utilizing containers of 250 gallons capacity or less which are mounted on farm vehicles and used for the application of ammonia to the soil. The items in this checklist under 1910.111(b) apply to this paragraph unless otherwise noted. Where larger containers are used they are required to comply with the items under 1910.111(g) of this checklist. (h)(1)

Design Pressure and Classification of Containers. (h)(2)

Is the minimum design pressure for containers 250 p.s.i.g? (h)(2)(i)

Is the shell or head thickness of any container not less than three-sixteenths of an inch? (h)(2)(ii)

Mounting of Containers. (h)(3)

Are precautions taken to insure that containers and flow-control devices are securely mounted? (h)(3)

Container Valves and Accessories. (h)(4)

Is each container provided with a fixed liquid-level gage? (h)(4)(i)

Is the filling connection fitted with one of the following: (a) a combination back-pressure check valve and an excess flow valve; (b) one double or two single back-pressure check valves; or (c) a positive shutoff valve in conjunction with an internal back-pressure check valve or an internal excess flow valve? (h)(4)(ii)

If the applicator tank is filled by venting to open air, does the bleeder valve orifice have an opening not exceeding seven-sixteenths inch in diameter? (h)(4)(iii)

Is regulation equipment connected directly to the tank coupling or flange, and is there a flexible connection used between such regulating equipment and the remainder of the liquid withdrawal system? (h)(4)(iv)

If the regulating equipment is not so installed, is it flexibly connected to the container shutoff valve? (h)(4)(iv)

If no excess flow valve is installed in the withdrawal line, is the controlling orifice between the contents of the container and the outlet of the shutoff not more than seven-sixteenths inch in diameter? (h)(4)(v)

1910.119 — PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS

YES NO

Purpose

This section contains requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals. These releases may result in toxic, fire or explosion hazards.

(a) Application

This section applies to the following:

A process which involves a chemical at or above the specified threshold quantities listed in Appendix A to this section; **(a)(1)(i)**

A process which involves a flammable liquid or gas [as defined in 1910.1200(c) of this part] on site in one location, in a quantity of 10,000 pounds (4535.9 kg) or more except for: **(a)(1)(ii)**

Hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane used for comfort heating, gasoline for vehicle refueling), if such fuels are not a part of a process containing another highly hazardous chemical covered by this standard; **(a)(1)(ii)(A)**

Flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration. **(a)(1)(ii)(B)**

This section does not apply to:

Retail facilities; **(a)(2)(i)**

Oil or gas well drilling or servicing operations; **(a)(2)(ii)**

OR

Normally unoccupied remote facilities. **(a)(2)(iii)**

(c) Employee Participation

Have the employers developed a written plan of action regarding the implementation of the employee participation required by this paragraph? **(c)(1)**

Have the employers consulted with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management in this standard? **(c)(2)**

Have employers provided to employees and their representatives access to process hazard analyses and to all other information required to be developed under this standard? **(c)(3)**

(d) Process Safety Information

In accordance with the schedule set forth in paragraph (e)(1) of this section, has the employer completed a compilation of written process safety information before conducting any process hazard analysis required by the standard? **(d)**

Does the compilation of written process safety information enable the employer and the employees involved in operating the process to identify and understand the hazards posed by those processes involving highly hazardous chemicals? **(d)**

Does this process safety information include information pertaining to the hazards of the highly hazardous chemicals used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process? **(d)**

1910.119 — PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS

YES NO

Information Pertaining to the Hazards of the Highly Hazardous Chemicals in the Process

Does this information consist of at least the following:

- Toxicity information
- Permissible exposure limits
- Physical data
- Reactivity data
- Corrosivity data
- Thermal and chemical stability data

AND

- Hazardous effects of inadvertent mixing of different materials that could foreseeably occur? **(d)(1)(i-vii)**

NOTE: Material Safety Data Sheets meeting the requirements of 29 CFR 1910.1200(g) may be used to comply with this requirement to the extent they contain the information required by this subparagraph. **(d)(1)**

Information Pertaining to the Technology of the Process

Does the information concerning the technology of the process include at least the following:

- A block flow diagram or simplified process flow diagram (see Appendix B to this section)
- Process chemistry
- Maximum intended inventory
- Safe upper and lower limits for such items as temperatures, pressures, flows or compositions

AND

- An evaluation of the consequences of deviations, including those affecting the safety and health of employees. **(d)(2)(i)(A-E)**

Where the original technical information no longer exists, has such information been developed in conjunction with the process hazard analysis in sufficient detail to support the analysis? **(d)(2)(ii)**

Information Pertaining to the Equipment in the Process

Does the information pertaining to the equipment in the process include:

- Materials of construction
- Piping and instrument diagrams (P&ID's)
- Electrical classification
- Relief system design and design basis
- Ventilation system design
- Design codes and standards employed
- Material and energy balances for processes built after May 26, 1992

AND

- Safety systems (e.g. interlocks, detection or suppression systems). **(d)(3)(i)(A-H)**

Has the employer provided documentation that equipment complies with recognized and generally accepted good engineering practices? (d)(3)(ii)

For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, has the employer determined and provided documentation that the equipment is designed, maintained, inspected, tested and operating in a safe manner? (d)(3)(iii)

(e)Process Hazard Analysis

Has the employer performed an initial process hazard analysis (hazard evaluation) on processes covered by this standard? (e)(1)

Is the process hazard analysis appropriate to the complexity of the process? (e)(1)

Does the analysis identify, evaluate and control the hazards involved in the process? (e)(1)

Have the employers determined and documented the priority order for conducting process hazard analyses based on a rationale which includes such considerations as extent of the process hazards, number of potentially affected employees, age of the process and operating history of the process? (e)(1)

Has the process hazard analysis been conducted as soon as possible, but not later than the following schedule:

No less than 50 percent of the initial process hazards analyses completed by May 26, 1994;

No less than 50 percent of the initial process hazards analyses completed by May 26, 1995;

No less than 75 percent of the initial process hazards analyses completed by May 26, 1996;

All initial process hazards analyses completed by May 26, 1997? (e)(1)(i-iv)

Process hazards analyses completed after May 26, 1987 which meet the requirements of this paragraph are acceptable as initial process hazards analyses. The process hazard analyses shall be updated and revalidated, based on their completion date, in accordance with paragraph (e)(6) of this section. (e)(1)(v)

Has the employer used one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed:

- What-If
- Checklist
- What-If/Checklist
- Hazard and Operability Study (HAZOP)
- Failure Mode and Effects Analysis (FMEA)
- Fault Tree Analysis

OR

- An appropriate equivalent methodology? (e)(2)(i-vii)

Does the process hazard analysis address:

- The hazards of the process
- The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace
- Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.)
- Consequences of failure of engineering and administrative controls
- Facility siting
- Human factors

AND

- A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace? (e)(3)(i-vii)

Is the process hazard analysis performed by a team with expertise in engineering and process operations? (e)(4)

Does the team include at least one employee who has experience and knowledge specific to the process being evaluated? (e)(4)

Is one member of the team knowledgeable in the specific process hazard analysis methodology being used? (e)(4)

Has the employer established a system to promptly address the team's findings and recommendations? (e)(5)

Has the employer assured that the recommendations are resolved in a timely manner and that the resolution is documented? (e)(5)

Has the employer documented what actions are to be taken? (e)(5)

Has the employer completed actions as soon as possible? (e)(5)

Has the employer developed a written schedule of when these actions are to be completed? (e)(5)

Has the employer communicated the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions? (e)(5)

At least every five (5) years after the completion of the initial process hazard analysis, has the process hazard analysis been updated and revalidated by a team meeting the requirements in paragraph (e)(4) of this section to assure that the process hazard analysis is consistent with the current process? (e)(6)

Has the employer retained process hazards, analyses and updates or revalidations for each process covered by this section, as well as the documented resolution of recommendations described in paragraph (e)(5) of this section for the life of the process? (e)(7)

(f) Operating Procedures

Has the employer developed and implemented written operating procedures that provide clear instructions for safety conducting activities involved in each covered process consistent with the process safety information? (f)(1)

Do these procedures address at least the following elements:

- *Steps for each operating phase:*

  Initial startup
  Normal operations
  Temporary operations

Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner

Emergency Operations

Normal shutdown

AND

Startup following a turnaround, or after an emergency shutdown. (f)(1)(i)(A-G)

- *Operating limits:*

Consequences of deviation

AND

Steps required to correct or avoid deviation. (f)(1)(ii)(A,B)

- *Safety and health considerations:*

Properties of, and hazards presented by, the chemicals used in the process

Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment

Control measures to be taken if physical contact or airborne exposure occurs

Quality control for raw materials and control of hazardous chemical inventory levels

AND

Any special or unique hazards. (f)(1)(iii)(A-E)

- *Safety systems and their functions.* (f)(1)(iv)

Are operating procedures readily accessible to employees who work in or maintain a process? (f)(2)

Are the operating procedures reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology and equipment, and changes to facilities? (f)(3)

Does the employer certify annually that these operating procedures are current and accurate? (f)(3)

Has the employer developed and implemented safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel? (f)(4)

Do these safe work practices apply to employees and contractor employees? (f)(4)

(g) Training

Initial Training

Is each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, trained in an overview of the process and in the operating procedures as specified in paragraph (f) of this section? (g)(1)(i)

Does the training include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks? (g)(1)(i)

In lieu of initial training for those employees already involved in operating a process on May 26,1992, an employer may certify in writing that the employee has the required knowledge, skills and abilities to safely carry out the duties and responsibilities as specified in the operating procedures. (g)(1)(ii)

Refresher Training

Is refresher training provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process? (g)(2)

Has the employer, in consultation with the employees involved in operating the process, determined the appropriate frequency of refresher training? (g)(2)

Training Documentation

Has the employer ascertained that each employee involved in operating a process has received and understood the training required by this paragraph? (g)(3)

Has the employer prepared a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training? (g)(3)

(h) Contractors

Application

This paragraph applies to contractors performing maintenance or repair, turnaround, major renovation or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services. (h)(1)

Employer Responsibilities

Does the employer, when selecting a contractor, obtain and evaluate information regarding the contract employees safety performance and programs? (h)(2)(i)

Does the employer inform contract employers of the known potential fire, explosion or toxic release hazards related to the contractor's work and the process? (h)(2)(ii)

Does the employer explain to contract employers the applicable provisions of the emergency action plan required by paragraph (n) of this section? (h)(2)(iii)

Has the employer developed and implemented safe work practices consistent with paragraph (f)(4) of this section, to control the entrance, presence and exit of contract employers and contract employees in covered process areas? (h)(2)(iv)

Does the employer periodically evaluate the performance of contract employers in fulfilling their obligations as specified in paragraph (h)(3) of this section? (h)(2)(v)

Does the employer maintain a contract employee injury and illness log related to the contractor's work in process areas? (h)(2)(vi)

Contract Employer Responsibilities

Does the contract employer assure that each contract employee is trained in the work practices necessary to safely perform his/her job? (h)(3)(i)

Does the contract employer assure that each contract employee is instructed in the known potential fire, explosion or toxic release hazards related to his/her job and the process, and the applicable provisions of the emergency action plan? **(h)(3)(ii)**

Does the contract employer document that each contract employee has received and understood the training required by this paragraph? **(h)(3)(iii)**

Has the contract employer prepared a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training? **(h)(3)(iii)**

Does the contract employer assure that each contract employee follows the safety rules of the facility including the safe work practices required by paragraph (f)(4) of this section? **(h)(3)(iv)**

Does the contract employer advise the employer of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work? **(h)(3)(v)**

(i) Pre-Startup Safety Review

Has the employer performed a pre-startup safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information? **(i)(1)**

- Does the pre-startup safety review confirm that prior to the introduction of highly hazardous chemicals to a process:
- Construction and equipment is in accordance with design specifications
- Safety, operating, maintenance, and emergency procedures are in place and are adequate
- For new facilities, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified facilities meet the requirements contained in management of change, paragraph (l).
- Training of each employee involved in operating a process has been completed? **(i)(2)(i-iv)**

(j) Mechanical Integrity

Application

Paragraphs (j)(2) through (j)(6) of this section apply to the following process equipment:

- Pressure vessels and storage tanks
- Piping systems (including piping components such as valves)
- Relief and vent systems and devices
- Emergency shutdown systems
- Controls (including monitoring devices and sensors, alarms, and interlocks)

AND

- Pumps. **(j)(1)(i-vi)**

Written Procedures

Has the employer established and implemented written procedures to maintain the on-going integrity of process equipment? **(j)(2)**

Training for Process Maintenance Activities

Has the employer trained each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the tasks in a safe manner? **(j)(3)**

Inspection and Testing

Are inspections and tests performed on process equipment? **(j)(4)(i)**

Do inspection and testing procedures follow recognized and generally accepted good engineering practices? **(j)(4)(ii)**

Is the frequency of inspections and tests of process equipment consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience? **(j)(4)(iii)**

Has the employer documented each inspection and test that has been performed on process equipment? **(j)(4)(iv)**

Does the documentation identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test? **(j)(4)(iv)**

Equipment Deficiencies

Does the employer correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in paragraph (d) of this section) before further use or in a safe and timely manner when necessary means are taken to assure safe operation? **(j)(5)**

Quality Assurance

In the construction of new plants and equipment, does the employer assure that equipment as it is fabricated is suitable for the process application for which they will be used? **(j)(6)(i)**

Are appropriate checks and inspections performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions? **(j)(6)(ii)**

Does the employer assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used? **(j)(6)(iii)**

(k) Hot Work Permit

Does the employer issue a hot work permit for hot work operations conducted on or near a covered process? **(k)(1)**

Does the permit document that the fire prevention and protection requirements in 29 CFR 1910.252(a) have been implemented prior to beginning the hot work operations? **(k)(2)**

Does the permit indicate the date(s) authorized for hot work? **(k)(2)**

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YES NO

Does the permit identify the object on which hot work is to be performed? (k)(2)

Is the permit kept on file until completion of the hot work operations? (k)(2)

(l) Management of Change

Has the employer established and implemented written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment and procedures; and changes to facilities that affect a covered process? (l)(1)

- Do the procedures assure that the following considerations are addressed prior to any change:
- The technical basis for the proposed change
- Impact of change on safety and health
- Modifications to operating procedures
- Necessary time period for the change

AND

- Authorization requirements for the proposed change? (l)(2)(i-v)

Are employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process informed of, and trained in, the change prior to start-up of the process or affected part of the process? (l)(3)

If a change covered by this paragraph results in a change in the process safety information required by paragraph (d) of this section, is such information updated accordingly? (l)(4)

If a change covered by this paragraph results in a change in the operating procedures or practices required by paragraph (f) of this section, are such procedures or practices updated accordingly? (l)(5)

(m) Incident Investigation

Has the employer investigated each incident which resulted in, or could reasonably have resulted in, a catastrophic release of highly hazardous chemical in the workplace? (m)(1)

Is an incident investigation initiated as promptly as possible, but not later than 48 hours following the incident? (m)(2)

Has an incident investigation team been established? (m)(3)

Does the team consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident? (m)(3)

- Is a report prepared at the conclusion of the investigation which includes at a minimum:
- Date of incident
- Date investigation began
- A description of the incident
- The factors that contributed to the incident

AND

- Any recommendations resulting from the investigation? (m)(4)(i-v)

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YES NO

Has the employer established a system to promptly address and resolve the incident report findings and recommendations? (m)(5)

Are all resolutions and corrective actions documented? (m)(5)

Is the report reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable? (m)(6)

Are incident investigation reports retained for five years? (m)(7)

(n) Emergency Planning and Response

Has the employer established and implemented an emergency action plan for the entire plant in accordance with the provisions of 29 CFR 1910.38(a)? (n)

In addition, does the emergency action plan include procedures for handling small releases? (n)

Employers covered under this standard may also be subject to the hazardous waste and emergency response provisions contained in 29 CFR 1910.120 (a), (p) and (q). (n)

(o) Compliance Audits

Do employers certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed? (o)(1)

Is the compliance audit conducted by at least one person knowledgeable in the process? (o)(2)

Is a report of the findings of the audit developed? (o)(3)

Has the employer promptly determined and documented an appropriate response to each of the findings of the compliance audit? (o)(4)

Has the employer documented that deficiencies have been corrected? (o)(4)

Has the employer retained the two (2) most recent compliance audit reports? (o)(5)

(p) Trade Secrets

Employers shall make all information necessary to comply with the section available to those persons responsible for compiling the process safety information (required by paragraph (d) of this section), those assisting in the development of the process hazard analysis (required by paragraph (e) of this section), those responsible for developing the operating procedures (required by paragraph (f) this section), and those involved in incident investigations (required by paragraph (m) of this section), emergency planning and response (paragraph (n) of this section) and compliance audits (paragraph (o) of this section) without regard to possible trade secret status of such information. (p)(1)

Nothing in this paragraph shall preclude the employer from requiring the persons to whom the information is made available under paragraph (p)(1) of this section to enter into confidentiality agreement not to disclose the information as set forth in 29 CFR 1910.1200. (p)(2)

Subject to the rules and procedures set forth in 29 CFR 1910.1200(i)(1) through 1910.1200(i)(12), employees and their designated representatives shall have access to trade secret information contained within the process hazard analysis and other documents required to be developed by this standard. (p)(3)

(a) Scope, Application, and Definitions

Scope

Unless it can be demonstrated that no health hazards are involved, this section applies to the following operations:

Clean-up operations required by a governmental body (federal, state, or local) involving hazardous substances, and operations conducted at uncontrolled hazardous waste sites (including the EPA's National Priority Site List, and state priority site lists); **(a)(1)(i)**

Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act (RCRA); **(a)(1)(ii)**

Voluntary clean-up operations at sites recognized by federal, state, or local governments as uncontrolled hazardous waste sites; **(a)(1)(iii)**

Operations involving hazardous wastes that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265, in accordance with RCRA; or by agencies under agreement with EPA to implement RCRA regulations; and **(a)(1)(iv)**

Emergency response operations for releases of, or potential releases of, hazardous substances without regard to the location of the hazard. **(a)(1)(v)**

Application

All requirements of Parts 1910 and 1926 (general industry and construction) of Title 29 apply in accordance with hazardous waste and emergency response operations, whether covered by this section or not. If there is a conflict or overlap, the provision which provides the most protection will apply. **(a)(2)(ii)**

Hazardous substance clean-up operations within the scope of paragraphs (a)(1)(i) through (a)(1)(iii) of this section must comply with all paragraphs of this section except (p) and (q). **(a)(2)(ii)**

Operations within the scope of paragraph (a)(1)(iv) of this section must comply only with the requirements of paragraph (p) of this section. **(a)(2)(iii)**

Emergency response operations which are not covered by paragraphs (a)(1)(i) through (a)(1)(iv) must only comply with the requirements of paragraph (q). **(a)(2)(iv)**

[**Notes and Exceptions:** (A) provisions of paragraph (p) of this section cover any treatment, storage, or disposal operation regulated by 40 CFR Parts 264 and 265, and any state law authorized under RCRA. They also apply to those operations which are required to have permits or interim status for EPA (40 CFR 270.1) or from a state agency according to RCRA. (B) Employers who are not required to have permits or interim status because they are exempt small quantity generators (40 CFR 262.34) are not covered by paragraphs (p)(1) through (p)(7) of this section. Excepted employers who are required to engage in emergency response or who direct their employees to engage in emergency response are covered by paragraph (p)(8), and are not exempted by (p)(8)(i). Excepted employers, who are not required to have employees engage in emergency response, or direct employees to evacuate and who meet the requirement of paragraph (p)(8)(i) of this section, are exempt from the balance of paragraph (p)(8) of this section. (C) If an area is used for treatment, storage, or disposal, any emergency response operation in that area must comply with paragraph (p)(8). In areas not used for treatment, storage, or disposal, any emergency response operations must comply with paragraph (q). Compliance with the requirements of paragraph (q) must be in compliance with paragraph (p)(8) of this section.]

Definitions.

See page H-v at the beginning of this chapter.

(b) General Requirements

Safety and Health Program

Has a written safety and health program been developed and implemented for employees involved in hazardous waste operations? **(b)(1)**

Is the program designed to identify, evaluate, and control safety and health hazards and provide for emergency response for hazardous waste operations? **(b)(1)**

Does the safety and health program include the following elements:

An organizational structure;

A comprehensive workplan;

A site safety and health plan;

A safety and health training program;

A medical surveillance program; and

Standard operating procedures. **(b)(ii)**

Site Excavations

Are site excavations created during initial site preparation or during hazardous waste operation shored or sloped in accordance with Subpart P of the construction standard to prevent accidental collapse? **(b)(iii)**

Contractors and Subcontractors

Are contractors and subcontractors informed of the site emergency response procedures and of any potential hazards within the hazardous waste site? **(b)(iv)**

Program Availability

Is the written safety and health program made available to any contractor or subcontractor who is involved in hazardous waste operations? **(b)(v)**

Is the written safety and health program made available to employees or their designated representatives; OSHA personnel; and federal, state, or local agencies with regulatory control of the site? **(b)(v)**

Organizational Structure

Does the organizational part of the safety and health program establish a specific chain of command and specify overall responsibility of supervisors and employees? **(b)(2)(i)**

Does the organizational structure include the following:

A general supervisor responsible for all hazardous waste operations;

A site safety and health supervisor responsible for implementing a site safety and health plan and for verifying compliance;

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YES NO

All other personnel needed for hazardous waste site operations and emergency response and their responsibilities; and

Lines of authority, responsibility, and communication. **(b)(2)(i)(A-D)**

Is the organizational structure updated and revised as necessary? **(b)(2)(ii)**

Comprehensive Workplan

Does the safety and health program include a comprehensive workplan which addresses the objectives of the site operation and logistics and resources required? **(b)(3)**

Does the comprehensive workplan address anticipated clean-up activities as well as normal operating procedures? **(b)(3)(i)**

Does the workplan define work tasks and identify methods for accomplishing such tasks and objectives? **(b)(3)(ii)**

Does the workplan establish personnel requirements and provide for the training required in paragraph (e) of this section? **(b)(3)(iii)(iv)**

Does the workplan provide for the implementation of the informational programs required in paragraph (i) of this section? **(b)(3)(v)**

Does the workplan provide for the implementation of the medical surveillance program described in paragraph (f) of this section? **(b)(3)(vi)**

Site-Specific Safety and Health Plan

Is there a site safety and health plan on-site which addresses the safety and health hazards of each phase of site operation and includes the requirements and procedures for employee protection? **(b)(4)**

Does the site safety and health plan address the following: **(b)(4)(ii)**

A site safety and health risk or hazard analysis for each site task and operation found in the workplan;

Employee training assignments to assure compliance with paragraph (e);

Personnel protective equipment in accordance with paragraph (g)(5);

Medical surveillance requirements in accordance with paragraph (f);

Frequency and types of air monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment;

Site control measures in accordance with paragraph (d);

Decontamination procedures in accordance with paragraph (k);

An emergency response plan in accordance with paragraph (l);

Confined space entry procedures; and

A spill contaminant program in accordance with paragraph (j).

Does the site-specific safety and health plan provide for pre-entry briefings to be held prior to any site activity? **(b)(4)(iii)**

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YES NO

Are inspections of the site safety and health plan conducted to determine its effectiveness? **(b)(4)(iv)**

(c) Site Characterization and Analysis

Is a preliminary evaluation of a site performed by qualified persons in order to aid in the selection of appropriate employee protection? **(c)(1)**

After the preliminary evaluation, is a more detailed examination performed to identify existing hazards and to further aid in the selection of protective gear? **(c)(2)**

Are all suspected conditions that may be dangerous to life or health identified during both examinations? **(c)(3)**

Required Information

To the extent possible, is the following information obtained before any employee is allowed to enter a site:

Location and approximate size of the site;

Description of the response activity and/or the job tasks to be performed;

Duration of the planned employee activity;

Site typography and accessibility by air and road;

Safety and health hazards expected at the site;

Pathways for hazardous substance dispersion;

Present status and capabilities of emergency response teams that would provide assistance to hazardous waste clean-up; and

Hazardous substances and health hazards involved at the site and their chemical and physical properties. **(c)(4)**

Personal Protective Equipment (PPE)

Based on the results of the preliminary site evaluation, is the appropriate PPE (which provides protection to a level of exposure below permissible exposure limits and published exposure levels for known or suspected hazardous substances) selected? **(c)(5)**

If there is no permissible exposure limit or published exposure level, are other published studies used as a guide to the selection of PPE? **(c)(5)(i)**

If positive-pressure self-contained breathing apparatus are not used as a part of the protective equipment, and if respiratory protection is warranted by other potential hazards identified during the site evaluation, is an escape self-contained breathing apparatus of at least five minute's duration carried by employees during initial site entry? **(c)(5)(ii)**

If a preliminary site evaluation does not provide enough information to identify the hazards or suspected hazards of the site, is an ensemble of PPE equivalent to Level B provided as minimum protection? (For a description of Level B protection, see Appendix B, page H-App-20.) **(c)(5)(iii)**

Are direct reading instruments used as appropriate for identifying IDLH (Immediately Dangerous to Life or Health) conditions? (See Appendix B.) **(c)(5)(iii)**

Once hazards have been identified, is the appropriate PPE selected and used in accordance with paragraph (g) of this section? **(c)(5)(iv)**

Monitoring

Are the following monitoring methods conducted during the initial site entry when the evaluation shows possible ionizing radiation or IDLH conditions, or when site information is not sufficient to eliminate these possible conditions:

Monitoring with direct reading instruments for hazardous levels of ionizing radiation;

Monitoring the air with appropriate direct reading equipment, such as test detector tubes, for IDLH and other conditions;

Visually observing for signs of actual or potential IDLH or other dangerous conditions; and

An ongoing air monitoring program in accordance with paragraph (h) of this section after site characterization has determined the site is safe for starting up operations. **(c)(6)**

Risk Identification

Once the presence and concentration of specific hazardous substances have been established, are the risks associated with these substances identified? **(c)(7)**

Are employees who will be working on the site informed of any risks? (Items already covered by the Hazard Communication Standard do not need to be duplicated.) **(c)(7)**

[**Note to (c)(7)**: Risks to consider include IDLH concentrations, potential skin absorption and irritation sources, potential eye irritation sources, explosion sensitivity and flammability, and oxygen deficiency.]

Employee Notification

Is any information, including the chemical, physical, and toxicological properties of each substance known or expected to be present on-site, made available to the affected employee before any work begins? **(c)(8)**

(d) Site Control

Have appropriate site procedures been implemented to control employee exposure to hazardous substances? **(d)(1)**

Site Control Program

Has a site control program in accordance with requirements in paragraph (b) of this section been developed during the planning stages of the hazardous clean-up? **(d)(2)**

Does the site control program, as a minimum, include the following elements: **(d)(3)**

A site map;

Site work zones;

The use of a buddy system;

Site communication, including alerting means for emergencies;

Standard operating procedures or safe work practices; and

Identification of the nearest medical assistance.

(e) Training

Have all employees working on the site received training which meets the requirement of this section before they are permitted to engage in hazardous waste operations? **(e)(1)(i)**

Are employees prohibited from participating in or supervising field activities until they have been through training to a level required by their job function? **(e)(ii)**

Are the following elements thoroughly covered in the training: **(e)(2)**

Names of personnel and alternates responsible for site safety and health;

Safety, health, and other hazards present on the site;

Use of personal protective equipment;

Work practices by which the employee can minimize risks from hazards;

Safe use of engineering controls and equipment on-site;

Medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards; and

The contents of paragraphs (g) through (j) of the site safety and health plan as set forth in paragraph (b)(4)(ii) of this section.

Initial Training

Have general site workers (such as equipment operators, general laborers, and supervisory personnel) engaged in hazardous substance removal received a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience? **(e)(3)(i)**

Have workers who are on-site only occasionally (i.e., for a specific task, such as ground water monitoring, land surveying, or geophysical surveying) and who are unlikely to be exposed over permissible exposure limits, received a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience? **(e)(3)(ii)**

Have workers regularly on-site, who work in areas which have been monitored and are under permissible exposure limits where respirators are not necessary, received a minimum of 24 hours of instruction off the site, and the minimum of one day actual field experience? **(e)(3)(iii)**

Have workers with 24 hours of training, who are covered by paragraphs (a)(3)(ii) and (a)(3)(iii) of this section, and who become general site workers or who are required to wear respirators, received an additional 16 hours and two days of training to the total amount of training specified in paragraph (e)(3)(i)?

Management and Supervisor Training

On-site management and supervisors directly responsible for employees engaged in hazardous waste operations have received 40 hours of initial training, and three days of supervised field experience. [The training may be reduced to 24 hours and one day if the only area of their responsibility is employees covered by paragraphs (e)(3)(ii) and (e)(3)(iii).] **(e)(4)**

Qualifications for Trainers

Trainers are qualified to instruct employees about the subject matter being presented. Trainers have completed a training program for teaching, or they shall have the academic credentials and instructional experience necessary for teaching the subjects. **(e)(5)**

Training Certification

Employees and supervisors that have received training and field experience specified in paragraphs (e)(1) through (e)(4) of this section shall be certified by their instructor or the head instructor and trained supervisor as having successfully completed the necessary training. **(e)(6)**

A written certificate is given to each person so certified. **(e)(6)**

Any person who has not been so certified or who does not meet the requirements of paragraph (e)(9) of this section is prohibited from engaging in hazardous waste operations. **(e)(6)**

Emergency Response

Are employees who respond to hazardous emergency situations that may expose them to hazardous substances trained in how to respond to such expected emergencies? **(e)(7)**

Refresher Training

Is eight hours of refresher training provided annually to employees and managers specified in paragraphs (e)(1) and (e)(4)? **(e)(8)**

Equivalent Training

If they can show proof, employees whose work experience and/or training is equivalent to that training required in paragraphs (e)(1) through (e)(4) are considered to meet the training requirements of this section. **(e)(9)**

Have certified employees new to a site received appropriate site-specific training and appropriate supervised field experience at the new site? **(e)(9)**

(f) Medical Surveillance

Employees Covered

Is a medical surveillance program instituted for the following employees: **(f)(1-2)**

All employees exposed to hazardous substances or health hazards at or above the permissible exposure limits, without regard to the use of respirators, for 30 days or more a year;

All employees who wear a respirator for 30 days or more a year or as required by 1910.134;

All employees who are injured due to overexposure from an emergency incident involving hazardous substances or health hazards; or

Members of HAZMAT teams.

Frequency of Medical Examinations and Consultations

Are medical examinations and consultations made available to each employee covered under paragraph (f)(2) of this section, based on the following schedules: **(f)(3)**

Prior to assignment;

At least once every 12 months for each employee covered unless the attending physician believes a longer interval (not greater than biennially) is appropriate;

At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had the examination within the last six months;

As soon as possible upon notification by an employee that he or she has developed symptoms indicating possible overexposure to hazardous substances;

More frequently, if the examining physician determines that an increased frequency of examination is medically necessary.

Content of Medical Examinations and Consultations

Do medical examinations include a medical and work history (or updated history if one is in the employee's file) with special emphasis on symptoms related to the handling of hazardous substances and to fitness for duty, including the ability to wear any required PPE under conditions that may be expected at the work site? **(f)(4)**

Examination by a Physician and Costs

Are all medical examinations and procedures performed by a licensed physician and provided without cost to the employee? **(f)(5)**

Information Provided to the Physician

Is the following information provided to the examining physician: **(f)(6)**

A copy of this standard and its appendices;

The employee's exposure levels or anticipated exposure levels;

A description of any personal protective equipment used; and

Information from previous medical examinations of the employee.

Physician's Written Opinion

Is every employee furnished with a copy of a written opinion from the attending physician? **(f)(7)**

Does the written opinion contain the following information:

The physician's opinion as to whether the employee has any detected medical conditions which would place him or her at risk if work in hazardous waste operations or emergency response continues;

The physician's recommended limitations upon the employee's assigned work;

The results of the medical examination and tests if requested by the employee; and

A statement that the employee has been informed of the results of the medical examination.

Recordkeeping

Is an accurate record of the medical surveillance retained for a specified time as required in 1910.20? **(f)(8)(i)**

Does the medical surveillance record include at least the following information:

The name and social security number of the employee;

The physician's written opinions, recommended limitations, and results of examinations and tests;

Any employee medical complaints related to exposure to hazardous substances; and

A copy of the information provided to the examining physician by the employer, with the exception of the standard and its appendices.

(g) Engineering Controls, Work Practices, and Personal Protective Equipment for Employee Protection

Where feasible, are engineering controls and work practices instituted to reduce and maintain employee exposure to or below the permissible exposure limits for substances regulated by Subparts Z? (g)(1)

When engineering controls and work practices are not feasible, is PPE used to reduce and maintain employee exposure? (g)(1)(ii)

Engineering Controls, Work Practices, and PPE for Substances Not Regulated in Subparts G and Z

For hazards not regulated by Subpart G and Z, is an appropriate combination of engineering controls, work practices, and PPE implemented to reduce and maintain employee exposure? (g)(2)

Personal Protective Equipment Selection (g)(3)

Is PPE selected and used which will protect employees from the hazards and potential hazards they are likely to encounter? (g)(3)(i)

Is PPE selection based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, the task-specific conditions and duration, and the hazards and potential hazards identified at the site? (g)(3)(ii)

In IDLH conditions, are positive pressure self-contained breathing apparatus, or positive pressure air-line respirators equipped with an escape air supply used? (g)(3)(iii)

Are totally-encapsulating chemical protective suits (Level A protection) used in conditions where contact of the skin by hazardous substances may result in an IDLH situation? (g)(3)(iv)

Is the level of protection provided by PPE increased when additional information or site conditions show it is necessary to reduce employee exposure below established permissible exposure limits for hazardous substances and health hazards? (See appendix B for guidance in selecting PPE.) (g)(3)(v)

When decreased protection will not result in hazardous exposures, the level of protection may be decreased. (g)(3)(v)

Is PPE selected and used in accordance with Subpart I and additional requirements in this section? (g)(3)(vi)

Totally-Encapsulating Chemical Protective Suits (g)(4)

Do totally-encapsulating suits meet the following requirements:

- materials used for Level A protection protect employees from the hazards identified during site characterization and analysis;
- they are capable of maintaining positive air pressure;
- they are capable of preventing inward test gas leakage of more than 0.5%. (g)(4)

Personal Protective Equipment (PPE) Program (g)(5)

Has a PPE program been established for hazardous waste operations that contains the following elements:

- site hazards;
- PPE selection;
- PPE use;
- work mission duration;
- PPE maintenance and storage;
- PPE decontamination;
- PPE training and proper fitting;
- PPE donning and doffing procedures;
- PPE inspection;
- PPE in-use monitoring;
- evaluation of effectiveness of PPE program;
- limitations during temperature extremes. (g)(5)

(h) Monitoring

Is air monitoring used to identify and quantify airborne levels of hazardous substances in order to determine the appropriate level of employee protection needed on site? (h)(1)

As a first step, is air monitoring conducted to identify any IDLH or other dangerous situations, such as flammable atmospheres, oxygen-deficient environments, toxic levels of airborne contaminants, and radioactive materials? (h)(2)

Is periodic monitoring conducted when:

- work begins on a different portion of the site;
- contaminants other than those previously identified are being handled;
- a different type of operation is initiated (e.g. drum opening as opposed to exploratory well drilling);
- employees are handling leaking drums or containers or working in areas with obvious liquid contamination (a spill or lagoon). (h)(3)

Are high risk employees (those closest to the source of contaminant generation) given personal monitoring sufficient to determine employee exposure? (h)(4)

(i) Informational Programs

General (i)(1)

Has a site safety and health plan for each hazardous waste operation been developed and implemented? (i)(1)

Site Safety and Health Plan (i)(2)

Is the site safety and health plan available on the site for inspection by employees, their designated representatives, and OSHA personnel? (i)(2)

Does the site safety and health plan address the safety and health hazards of each phase of site operation and include the following:

- names of key personnel and alternates responsible for site safety and health, and appointment of a site safety and health officer;
- a safety and health risk analysis for each site task and operation;
- employee training assignments;
- PPE to be used by employees for each of the site tasks and operations being conducted;

medical surveillance requirements;
frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, as well as methods of maintenance and calibration of monitoring and sampling equipment to be used;
site control measures;
decontamination procedures;
site's standard operating procedures;
a contingency plan for safe and effective responses to emergencies and including the necessary PPE and other equipment;
confined space entry procedures. (i)(2)(i)

Prior to initiating any site activity and at other times as necessary are pre-entry briefings held to ensure employees are apprised of the site safety and health plan and that it is being followed? (i)(2)(ii)

Are inspections conducted by the site safety and health officer or another individual as necessary, to determine the effectiveness of the site safety and health plan? (i)(2)(iii)

Are any deficiencies in the effectiveness of the plan corrected promptly? (i)(2)(iii)

(j) Handling Drums and Containers

General (j)(1)

Do drums and containers used during the clean-up meet the appropriate DOT, OSHA, and EPA regulations for the wastes that they contain? (j)(1)(i)

Prior to being moved, are drums and containers inspected and their integrity assured? If they cannot be inspected before being moved because of inaccessible storage conditions, are they first moved to an accessible location and inspected prior to further handling? (j)(1)(ii)

Are unlabeled drums and containers considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled? (j)(1)(iii)

Are site operations organized to minimize the amount of drum or container movement? (j)(1)(iv)

Prior to movement of drums and containers, are all employees exposed to the transfer operation warned of the potential hazards associated with the contents of the drums or containers? (j)(1)(v)

Are DOT-specified salvage drums or containers and suitable quantities of proper absorbent kept available and used in areas where spills, leaks, or ruptures may occur? (j)(1)(vi)

Where major spills may occur, is a spill containment program implemented to contain and isolate the entire volume of hazardous substance being transferred? (j)(1)(vii)

Are drums and containers that cannot be moved without rupture, leakage, or spillage emptied into a sound container using a devise classified for the material being transferred? (j)(1)(viii)

Is a ground-penetrating system or other type of detection system or device used to estimate the location and depth of drums and containers? (j)(1)(ix)

Is soil or covering material removed with caution to prevent drum or container rupture? (j)(1)(x)

Opening Drums and Containers (j)(2)

Are the following procedures followed in areas where drums or containers are being opened:
where an airline respirator system is used, connections to the bank of air cylinders are protected from contamination and the entire system is protected from physical damage;
employees not actually involved in opening drums or containers are kept a safe distance from the drums or containers being opened;
if employees must work near or adjacent to drums or containers being opened, a suitable shield that does not interfere with the work operation is placed between the employee and the drums or containers being opened to protect the employee in case of accidental explosion;
controls for drum or container opening equipment, monitoring equipment, and fire suppression equipment is located behind the explosion-resistant barrier;
material handling equipment and hand tools are not sources of ignition (non-sparking);
drums and containers are opened so that interior pressure is safely relieved;
if pressure cannot be relieved from a remote location, appropriate shielding is placed between the employee and the drums or containers to reduce the risk of employee injury;
employees do not stand upon or work from drums or containers. (j)(2)

Material Handling Equipment

Is material handling equipment used to transfer drums and containers selected, positioned, and operated to minimize sources of ignition from igniting vapors released from ruptured drums or containers? (j)(3)

Radioactive Wastes (j)(4)

Are drums and containers containing radioactive wastes not handled until their hazards are properly assessed? (j)(4)

Shock Sensitive Wastes (j)(5)

When drums and containers containing or suspected of containing shock-sensitive wastes, are the following special precautions taken:
all nonessential employees are evacuated from the area of transfer;
material handling equipment is provided with explosive containment devices or protective shields to protect equipment operators from exploding containers;
an employee alarm system capable of being perceived above the surrounding light and noise conditions is used to signal the commencement and completion of explosive waste handling activities;
continuous communications (portable radios, hand signals, telephones, etc.) are maintained between the employee in charge of the immediate handling area and the site safety officer or command post until the handling operation is completed. (communication equipment or methods that could cause shock-sensitive materials to explode should not be used);
drums and containers under pressure, as evidenced by bulging or swelling, are not moved until the cause for excess pressure is determined and containment procedures have been implemented to protect employees from explosive relief of the drum;

drums and containers containing packaged laboratory wastes are considered to contain shock-sensitive or explosive materials until they have been characterized. *Note: Shipping of shock-sensitive wastes may be prohibited under U.S. DOT regulations. Employers and their shippers should refer to 49 CFR 173.21 and 173.50.* **(j)(5)**

Laboratory Waste Packs **(j)(6)**

When handling laboratory wastes, the following precautions are taken in addition to the above requirements:

lab packs are opened only when necessary and then only by an individual knowledgeable in the inspection, classification, and segregation of the containers within the pack according to the hazards of the wastes;

if crystalline material is noted on any container, the contents are handled as a shock-sensitive waste until identified. **(j)(6)**

Sampling Drums and Containers **(j)(7)**

Is sampling of drums and containers conducted in accordance with a sampling procedure laid out in the site safety and health plan? **(j)(7)**

Shipping and Transport **(j)(8)**

Are drums and containers identified and classified prior to packaging for shipment? **(j)(8)(i)**

Are drum or container staging areas kept to the minimum number necessary to safely identify and classify materials and prepare them for transport? **(j)(8)(ii)**

Are staging areas provided with adequate access and egress routes? **(j)(8)(iii)**

Is bulking of hazardous wastes permitted only after a thorough characterization of the materials has been completed? **(j)(8)(iv)**

Tank and Vault Procedures **(j)(9)**

Are tanks and vaults containing hazardous substances handled in a similar manner to drums and containers, taking into consideration the differences in size? **(j)(9)(i)**

Whenever employees must enter a tank or vault, are appropriate tank or vault entry procedures meeting the requirements of the site safety and health plan followed? **(j)(9)(ii)**

(k) Decontamination

Decontamination Procedures

Before any employees or equipment may enter areas where the potential for exposure to hazardous substances exits, has a decontamination procedure been developed, communicated to employees, and implemented? **(k)(1)(2)**

Have standard operating procedures been developed to minimize employee contact with hazardous substances or with equipment that has been in contact with hazardous substances? **(k)(2)(ii)**

Are all employees leaving a contaminated area decontaminated and all contaminated clothing and equipment disposed of or decontaminated? **(k)(2)(iii)**

Are decontamination procedures monitored by the site safety and health supervisor to determine their effectiveness? **(k)(2)(iv)**

Location

Is decontamination performed in geographical areas that will minimize the exposure of uncontaminated employees or equipment to contaminated employees or equipment? **(k)(3)**

Equipment and Solvents

Are all equipment and solvents used for decontamination decontaminated or properly disposed of? **(k)(4)**

Personal Protective Clothing and Equipment

Are protective clothing and equipment decontaminated, cleaned, laundered, maintained, or replaced as needed to maintain their effectiveness? **(k)(5)**

Unauthorized Employees

Are unauthorized employees whose clothing becomes wetted with hazardous substances required to remove that clothing and proceed to shower? **(k)(6)**

Is the clothing disposed of or decontaminated before it is removed from the work zone? **(k)(6)**

Commercial Laundries and Cleaning Establishments

Are commercial laundries and cleaning establishments informed of the potential harmful effects of exposure to hazardous waste before they are contracted to clean contaminated clothing? **(k)(7)**

Showers and Change Rooms

Where the decontamination procedures indicate a need, are showers and change rooms provided outside contaminated areas, which comply with 1910.141? **(k)(8)**

(l) Emergency Response by Employees at Uncontrolled Hazardous Waste Sites

Emergency Response Plan

Has an emergency response plan been developed and implemented to handle anticipated emergencies prior to the commencement of hazardous waste operations? **(l)(1)(i)**

Is the plan in writing and available for inspection and copying by employees, their representatives, OSHA personnel, and governmental agencies? **(l)(1)(i)**

[**Note:** Employers who make a policy of evacuating their employees from the workplace when an emergency occurs, and do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan that complies with section 1910.38(a).] **(l)(1)(ii)**

Elements of an Emergency Response Plan

Does the emergency response contain at least the following: **(l)(2)**

Pre-emergency planning;

Personnel roles, lines of authority, and communication;

Emergency recognition and prevention;

Safe distances and places of refuge;

Site security and control;

Evacuation routes and procedures;

YES NO

Decontamination procedures which are not covered by the site safety and health plan;

Emergency medical treatment and first aid;

Emergency alerting and response procedures;

Critique of response and follow-up; and

PPE and emergency equipment.

Procedures for Handling Emergency Incidents

Does the emergency response plan also include the following:

Site topography, layout, and prevailing weather conditions; and

Procedures for reporting incidents to local, state, and federal governmental agencies. **(l)(3)(i)**

Is the emergency response plan treated separately from the Site Safety and Health Plan? **(l)(3)(ii)**

Is the emergency response plan compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies? **(l)(3)(iii)**

Is the emergency response plan rehearsed regularly as part of the overall training program for site operations? **(l)(3)(iv)**

Is the site emergency response plan reviewed periodically and amended, as necessary, to keep it current with new or changing site conditions or information? **(l)(3)(v)**

Has an employee alarm system been installed, in accordance with 1910.165, to notify employees of an emergency situation? **(l)(3)(vi)**

(m) Illumination

While work is in progress, are work areas lighted to not less than the minimum illumination intensities listed in Table H-102.1? **(m)**

TABLE H-102.1. — MINIMUM ILLUMINATION INTENSITIES IN FOOT-CANDLES

Foot-candles	Area or operations
5	General site areas.
3	Excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: warehouses, corridors, hallways, and exitways.
5	Tunnels, shafts, and general underground work areas; (Exception: minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, mucking, and scaling.. Bureau of Mines approved cap lights shall be acceptable for use in the tunnel heading.
10	General shops (e.g., mechanical and electrical equipment rooms, active storerooms, barracks or living quarters, locker or dressing rooms, dining areas, and indoor toilets and workrooms.
30	First aid stations, infirmaries, and offices.

YES NO

(n) Sanitation at Temporary Workplaces

Potable Water **(n)(1)**

Is an adequate supply of potable water provided on the site? **(n)(1)(i)**

Are portable containers used to dispense drinking water capable of being closed tightly and equipped with a tap? Is dipping water from containers prohibited? **(n)(1)(ii)**

Are containers used to distrubute drinking water clearly marked as to the nature of their contents and not used for any other purpose? **(n)(1)(iii)**

Where single service cups (to be used only once) are supplied, are both a sanitary container for unused cups and a receptacle for disposing of used cups provided? **(n)(1)(iv)**

Nonpotable Water **(n)(2)**

Are outlets for nonpotable water (water for industrial or fire-fighting purposes) identified to indicate clearly that the water is unsafe and not to be used for drinking, washing, or cooking purposes? **(n)(2)(i)**

Is there no open or potential cross-connection between a system furnishing potable water and a system furnishing nonpotable water? **(n)(2)(ii)**

Toilet Facilities **(n)(3)**

Are toilets provided for employees according to Table H-102.2? **(n)(3)(i)**

TABLE H-102.2. — TOILET FACILITIES

Number of employees	Minimum number of facilities
20 or fewer	One.
More than 20, fewer than 200.	One toilet seat and 1 urinal per 40 employees.
More than 200	One toilet seat and 1 urinal per 50 employees.

Under temporary field conditions, is not less than one toilet facility available? **(n)(3)(ii)**

Unless prohibited by local codes, are hazardous waste sites not provided with a sanitary sewer provided with the following toilet facilities:

privies;
chemical toilets;
recirculating toilets; or
combustion toilets. **(n)(3)(iii)**

Mobile crews having transportation readily available to nearby toilet facilities are exempt from the sanitation requirements. **(n)(3)(iv)**

Food Handling **(n)(4)**

Do employee food service facilities and operations meet the applicable laws, ordinances, and regulations of the jurisdictions in which they are located? **(n)(4)**

Temporary Sleeping Quarters **(n)(5)**

When temporary sleeping quarters are provided, are they heated, ventilated, and lighted? **(n)(5)**

Washing Facilities **(n)(6)**

Are adequate washing facilities provided for employees engaged in operations where hazardous substances may be harmful, and are these facilities in near proximity to the worksite, within controlled access work zones, and equipped to enable employees to remove hazardous substances? **(n)(6)**

Shower and Change Rooms

If clean-up and removal operations require six months or more time to complete, are showers and change rooms provided for all employees exposed to hazardous substances and health hazards? **(n)(7)**

Do all change rooms meet the requirements of 1910.141 (e)? **(n)(7)(i)**

Are all showers and change rooms located in areas where exposures are below the permissible exposure limits; or if this can't be accomplished, is a ventilation system provided? **(n)(7)(ii)**

(o) New Technology Programs

Are procedures for introducing new technologies and equipment developed for improved protection? **(o)(1)**

Are new technologies, equipment, or control measures, such as foams, absorbents, adsorbents, neutralizers, etc., evaluated to determine their effectiveness? **(o)(2)**

(p) Certain Operations Conducted under the Resource Conservation and Recovery Act (RCRA)

If your operations involved hazardous waste treatment, storage, and disposal (TSD), as specified in (a)(1)(iv), have you: **(p)(1)**

Developed a written safety and health program;

Implemented a hazard communication program that meets the requirements of 1910.120 in Subpart Z;

Developed and implemented a medical surveillance program according to paragraph (f);

Developed and implemented procedures to meet the requirements of paragraph (o);

Developed and implemented a program for handling drums and containers;

Developed and implemented a training program which is part of the safety and health program; and

Developed an emergency response program according to paragraph (l).

(q) Emergency Response to Hazardous Substance Releases

This paragraph covers facilities engaged in emergency response operations no matter where it occurs, except for employees engaged in operations specified in paragraphs (a)(1)(i) through (a)(1)(iv) of this section. Those emergency response organizations who have developed and implemented programs equivalent to this paragraph for handling releases of hazardous substances pursuant to section 303 of the Superfund Amendments and Reauthorization Act of 1986 (Emergency Planning and Community Right-to Know Act of 1986, 42 U.S.C. 11003) shall be deemed to have met the requirements of this paragraph. **(q)**

Emergency Response Plan

Has an emergency response plan been developed and implemented to handle anticipated emergencies prior to the commencement of emergency response operations? **(q)(1)**

Is the plan in writing and available for inspection and copying by employees, their representatives and OSHA personnel?

Employers who evacuate their employees from the danger area when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency are exempt from the requirements of this paragraph if they provide an emergency action plan in accordance with 1910.38(a) of this part. **(q)(1)**

Elements of an emergency response plan

Has the employer developed an emergency response plan for emergencies which shall address, as a minimum, the following to the extent that they are not addressed elsewhere? **(q)(2)**

Pre-emergency planning and coordination with outside parties **(q)(2)(i)**

Personnel roles, lines of authority, training and communication **(q)(2)(ii)**

Emergency recognition and prevention **(q)(2)(iii)**

Safe distances and places of refuge **(q)(2)(iv)**

Site security and control **(q)(2)(v)**

Evacuation routes and procedures **(q)(2)(vi)**

Decontamination **(q)(2)(vii)**

Emergency medical treatment and first aid **(q)(2)(viii)**

Emergency alerting and response procedures **(q)(2)(ix)**

Critique of response and follow-up **(q)(2)(x)**

PPE and emergency equipment **(q)(2)(xi)**

Emergency response organizations may use the local emergency response plan or the state emergency response plan or both, as part of their emergency plan to avoid duplication. Those items of the emergency response plan that are being properly addressed by the SARA Title III plans may be substituted into their emergency plan or otherwise kept together for the employer's and employee's use **(q)(2)(xii)**

Procedures for Handling Emergency Response

Is there a senior emergency response official in charge of a site-specific Incident Command System (ICS)? **(q)(3)(i)**

[**Note to** (q)(3)(i): The "senior official" at an emergency response is the most senior official on the site who has the responsibility for controlling the operations at the site. Initially, it is the first senior officer to arrive on the incident scene. As more senior officers arrive (i.e., battalion chief, fire chief, state law enforcement officials, site coordinator), the position is passed up the line of authority which has been previously established.]

Has the individual in charge of the ICS identified, to the extent possible, all hazardous substances or conditions present and addressed site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies? **(q)(3)(ii)**

Based on the hazardous substances present, has the individual in charge of the ICS implemented appropriate emergency operations, and assured that the appropriate PPE is used? **(q)(3)(iii)**

1910.120 – HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE	YES	NO
Are employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard required to wear positive pressure self-contained breathing apparatus while engaged in emergency response? (q)(3)(iv)		
Is positive pressure self-contained breathing apparatus worn until the individual in charge of ICS determines through the use of air monitoring that a decreased level of respiratory protection will not result in hazardous exposure to employees? (q)(3)(iv)		
Does the individual in charge of the ICS limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations? (q)(3)(v)		
Are operations in the hazardous areas performed using the buddy system in groups of two or more? (q)(3)(v)		
Are back-up and first aid personnel, who are ready to give assistance or rescue, provided? (q)(3)(vi)		
Are advance first aid support personnel, as a minimum, standing by with medical equipment and transportation capability? (q)(3)(vi)		
Has the individual in charge of the ICS designated a safety official, who is knowledgeable in the operations, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations? (q)(3)(viii)		
When activities are judged by the safety official to be an IDLH condition and/or to involve an imminent danger condition, does the safety official have authority to alter, suspend, or terminate those activities? (q)(3)(viii)		
Does the safety official immediately inform the individual in charge of the ICS of any actions needed to be taken to correct these hazards at the emergency scene? (q)(3)(viii)		
After emergency operations have terminated, has the individual in charge of the ICS implemented appropriate decontamination procedures? (q)(3)(ix)		
Are approved self-contained compressed air breathing apparatus used when deemed necessary for meeting the tasks at hand? (q)(3)(x)		
Are approved self-contained compressed air breathing apparatus used with approved cylinders from other approved self–contained compressed air breathing apparatus, providing that such cylinders are of the same capacity and pressure rating? (q)(3)(x)		
Do all compressed air cylinders used with the self-contained breathing apparatus meet U.S. Department of Transportation and NIOSH criteria? (q)(3)(x)		
Skilled Support Personnel		
Personnel (not necessarily an employer's own employees), who will be or may be exposed to the hazards at an emergency response scene are not required to meet the training required in this paragraph, if: (q)(4)		
They are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment; (q)(4)		
AND		

1910.120 – HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE	YES	NO
They are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely manner by an employer's own employees. (q)(4)		
However, are skilled personnel, brought in temporarily to perform immediate emergency support work, briefed at the site prior to their participation in any emergency response? (q)(4)		
Does the briefing include instruction in the wearing of appropriate PPE, what chemical hazards are involved, and what duties are to be performed? (q)(4)		
Are all other appropriate safety and health precautions provided to the employer's own employees used to assure the safety and health of these personnel? (q)(4)		
Specialist Employees		
Have employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice at a hazardous substance release incident to the individual in charge, received training or demonstrated competency in the area of their specialization annually? (q)(5)		
Training		
Is training based on the duties and functions to be performed by each responder of an emergency response organization? (q)(6)		
Do the skill and knowledge levels required for all new responders include those hired after the effective date of this standard? (q)(6)		
Are the skill and knowledge levels conveyed to all responders through training before they are permitted to take part in actual emergency operations on an incident? (q)(6)		
Are employees who participate, or are expected to participate, in emergency response, given training in accordance with the following paragraphs? (q)(6)		
First Responders		
Are first responders (those individuals who are likely to witness or discover a hazardous substance release and who have been trained to notify the proper authorities of the release) instructed to take no further action beyond notifying the authorities of the release? (q)(6)(i)		
Do first responders have sufficient training or sufficient experience to objectively demonstrate competency in the following areas: (q)(6)(i)		
Understanding what hazardous materials are, and the risks associated with them in an incident; (q)(6)(i)(A)		
Understanding the potential outcomes associated with an emergency created when hazardous materials are present; (q)(6)(i)(B)		
Recognizing the presence of hazardous materials in an emergency; (q)(6)(i)(C)		
Identifying the hazardous materials; (q)(6)(i)(D)		
Understanding the role of the first responder awareness individual in the employer's emergency response plan including site security and control and the U.S. Department of Transportation's Emergency Reponse Guidebook. (q)(6)(i)(E)		
Realizing the need for additional resources, and to make appropriate notifications to the communication center. (q)(6)(i)(F)		

First Responders at Operations Level

Are first responders at the operations (those individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment) trained to respond in a defensive fashion without actually trying to stop the release? **(q)(6)(ii)**

Is their function to contain the release from a safe distance, keep it from spreading and prevent exposures? **(q)(6)(ii)**

Have first responders at the operation level recieved at least eight hours of training or sufficient experience to objectively demonstrate competency in the following areas: **(q)(6)(ii)**

Knowing the basic hazard and risk assessment techniques **(q)(6)(ii)(A)**

Selecting and using proper personal protective equipment provided to the first responder operational level; **(q)(6)(ii)(B)**

Understanding basic hazardous materials terms; **(q)(6)(ii)(C)**

Performing basic control, containment, and confinement operations; **(q)(6)(ii)(D)**

Implementing basic decontamination procedures; and **(q)(6)(ii)(E)**

Understanding the relevant standard operating procedures and termination procedures. **(q)(6)(ii)(F)**

Hazardous Materials Technicians

Have hazardous materials technicians (those individuals who respond to releases or potential releases for the purpose of stopping the release) received at least 24 hours of training equal to the first responder operations level, and in addition, do they have competency in the following areas: **(q)(6)(iii)**

Implementing the employer's emergency response plan; **(q)(6)(iii)(A)**

Knowing the classification, identification, and verification of known and unknown materials by using field survey instruments and equipment; **(q)(6)(iii)(B)**

Functioning within an assigned role in the ICS; **(q)(6)(iii)(C)**

Selecting and using proper specialized chemical personal protective equipment provided to the hazardous materials technician; **(q)(6)(iii)(D)**

Understanding hazard and risk assessment techniques; **(q)(6)(iii)(E)**

Performing advance control, containment, and/or confinement operations; **(q)(6)(iii)(F)**

Understanding decontamination procedures; **(q)(6)(iii)(G)**

Understanding termination procedures; and **(q)(6)(iii)(H)**

Understanding basic chemical and toxicological terminology. **(q)(6)(iii)(I)**

Hazardous Materials Specialists

Do hazardous materials specialists (those individuals who respond with and provide support to hazardous materials technicians) receive 24 hours of training and have competency in the following areas: **(q)(6)(iv)**

Implementing the local emergency response plan; **(q)(6)(iv)(A)**

Classifying, identifying, and verifying known and unknown materials by using advanced survey instruments and equipment; **(q)(6)(iv)(B)**

Knowing the state emergency response plan; **(q)(6)(iv)(C)**

Selecting and using proper specialized chemical personal protective equipment provided to the hazardous materials specialist; **(q)(6)(iv)(D)**

Understanding in-depth hazard and risk techniques; **(q)(6)(iv)(E)**

Performing specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available; **(q)(6)(iv)(F)**

Determining and implementing decontamination procedures; **(q)(6)(iv)(G)**

Developing a site safety and control plan; and **(q)(6)(iv)(H)**

Understanding chemical, radiological, and toxicological terminology. **(q)(6)(iv)(I)**

On Scene Incident Commander

Have incident commanders (those individuals who assume control of the incident scene beyond the first responder awareness level) recieved at least 24 hours of training equal to the first responder operations level, and in addition do they have competency in the following areas: **(q)(6)(v)**

Implementing the employer's incident command system; **(q)(6)(v)(A)**

Implementing the employer's emergency response plan; **(q)(6)(v)(B)**

Knowing and understanding the hazards and risks associated with employees working in chemical protective clothing; **(q)(6)(v)(C)**

Implementing the local emergency response plan; **(q)(6)(v)(D)**

Knowledge of the state emergency response plan and of the Federal Regional Response Team; and **(q)(6)(v)(E)**

Knowing and understanding the importance of decontamination procedures. **(q)(6)(v)(F)**

Trainers

Have trainers satisfactorily completed a training course for teaching the subjects they are expected to teach, such as the courses offered by the U.S. Fire Academy, or do they have the training and/or academic credentials and instructional experience? **(q)(7)**

Refresher Training

Do those employees who are trained in accordance with paragraph (q)(6) of this section receive annual refresher training of sufficient content and duration to maintain competency or demonstrate competency in those areas at least yearly? **(q)(8)(i)**

Is a statement made of the training or competency of employees? **(q)(8)(ii)**

Does the employer keep a record of the methodology used to demonstrate competency if a statement has been made? **(q)(8)ii)**

Medical Surveillance Program

Have members of an organized and designated HAZMAT team and hazardous materials specialists received a baseline physical examination and are they provided with medical surveillance as required in paragraph (f) of this section? **(q)(9)**

1910.120 — HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE

	YES	NO
Does any emergency response employee who exhibits signs or symptoms of overexposure to hazardous substances immediately receive medical consultation, as required in paragraph (f)(3)(ii) of this section? **(q)(9)(ii)**		
Chemical Protective Clothing		
Does all chemical protective clothing and equipment used by organized and designated HAZMAT team members or by hazardous materials specialists, meet the requirements of paragraphs (g)(3) through (5) of this section? **(q)(10)**		
Post-emergency Response Operations		
If it is necessary to remove hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident, the facility conducting the clean-up shall comply with one of the following: **(q)(11)**		
Meet all of the requirements of paragraphs (b) through (o) of this section; or **(q)(11)(i)**		
Where the clean-up is done on plant property using plant or workplace employees, such employees shall have completed the training requirements of the following: 29 CFR 1910.38(a); 1910.134; 1910.1200, and other appropriate safety and health training made necessary by the tasks that are expected to be performed. All equipment to be used in the performance of the clean-up work shall be in serviceable condition and shall have been inspected prior to use. **(q)(11)(ii)**		

	YES	NO

TABLE H-1 – Permissible Storage Locations for Hydrogen Systems

Nature of location	Size of hydrogen system		
	Less than 3,000 CF	3,000 CF to 15,000 CF	In excess of 15,000 CF
Outdoors	I	I	I.
In a separate building	II	II	II.
In a special room	III	III	Not permitted.
Inside buildings not in a special room and exposed to other occupancies.	IV	Not permitted.	Not permitted.

TABLE H-2 – Minimum Distance (feet) from Hydrogen System, Capacity and Location

Type of outdoor exposure		Size of hydrogen system		
		Less than 3,000 CF	3,000 CF to 15,000 CF	In excess of 15,000 CF
1. Building or structure	Wood frame construction*	10	25	50
	Heavy timber, noncombustible or ordinary construction*	0	10	**25
	Fire-resistive construction*	0	0	0
2. Wall openings	Not above any part of a system	10	10	10
	Above any part of a system	25	25	25
3. Flammable liquids above ground.	0 to 1,000 gallons	10	25	25
	In excess of 1,000 gallons	25	50	50
4. Flammable liquids below ground—0 to 1,000 gallons.	Tank	10	10	10
	Vent or fill opening of tank	25	25	25
5. Flammable liquids below ground—in excess of 1,000 gallons.	Tank	20	20	20
	Vent or fill opening of tank	25	25	25
6. Flammable gas storage, either high pressure or low pressure.	0 to 15,000 CF capacity	10	25	25
	In excess of 15,000 CF capacity	25	50	50
7. Oxygen storage	12,000 CF or less	Refer to NFPA No. 51, gas systems for welding and cutting (1969).		
	More than 12,000 CF	Refer to NFPA No. 566, bulk oxygen systems at consumer sites (1969).		
8. Fast burning solids such as ordinary lumber, excelsior or paper		50	50	50
9. Slow burning solids such as heavy timber or coal		25	25	25
10. Open flames and other sources of ignition		25	25	25
11. Air compressor intakes or inlets to ventilating or air-conditioning equipment		50	50	50
12. Concentration of people***		25	50	50

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*Refer to NFPA No. 220 Standard Types of Building Construction for definitions of various types of construction. (1969 Ed.)

**But not less than one-half the height of adjacent side wall of the structure.

***In congested areas such as offices, lunchrooms, locker rooms, time-clock areas.

TABLE H-3 – Maximum Total Quantity of Liquified Hydrogen Storage Permitted

Nature of location	Size of hydrogen storage (capacity in gallons)			
	39.63 (150 liters) to 50	51 to 300	301 to 600	In excess of 600
Outdoors	I	I	I	I.
In a separate building	II	II	II	Not permitted.
In a special room	III	III	Not permitted	Not permitted.
Inside buildings not in a special room and exposed to other occupancies.	IV	Not permitted	Not permitted	Not permitted.

NOTE: This table does not apply to the storage in dewars of the type generally used in laboratories for experimental purposes.

TABLE H-4 – Minimum Distance (feet) from Liquified Hydrogen Systems to Exposure

Type of exposure	Liquefied hydrogen storage (capacity in gallons)		
	39.63 (150 liters) to 3,500	3,501 to 15,000	15,001 to 30,000
1. Fire-resistive building and fire walls*	5	5	5
2. Noncombustible building*	25	50	75
3. Other buildings*	50	75	100
4. Wall openings, air-compressor intakes, inlets for air-conditioning or ventilating equipment	75	75	75
5. Flammable liquids (above ground and vent or fill openings if below ground) (see 513 and 514)	50	75	100
6. Between stationary liquefied hydrogen containers	5	5	5
7. Flammable gas storage	50	75	100
8. Liquid oxygen storage and other oxidizers (see 513 and 514)	100	100	100
9. Combustible solids	50	75	100
10. Open flames, smoking, and welding	50	50	50
11. Concentrations of people†	75	75	75

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*Refer to Standard Types of Building Construction, NFPA No. 220-1969 for definitions of various types of construction.

†In congested areas such as offices, lunchrooms, locker rooms, time-clock areas,

(Tables H-5 through H-9 were revoked.)

TABLE H-10 – Wetted area versus cubic feet free air per hour.

(14.7 psia and 60° F.)

Square feet	CFH	Square feet	CFH	Square feet	CFH
20	21,100	200	211,000	1,000	524,000
30	31,600	250	239,000	1,200	557,000
40	42,100	300	265,000	1,400	587,000
50	52,700	350	288,000	1,600	614,000
60	63,200	400	312,000	1,800	639,000
70	73,700	500	354,000	2,000	662,000
80	84,200	600	392,000	2,400	704,000
90	94,800	700	428,000	2,800	742,000
100	105,000	800	462,000	and	
120	126,000	900	493,000	over	
140	147,000	1,000	524,000		
160	168,000				
180	190,000				
200	211,000				

TABLE H-11 – Vent line diameters

Maximum flow GPM	Pipe length*		
	50 feet	100 feet	200 feet
	Inches	*Inches*	*Inches*
100	1¼	1¼	1¼
200	1¼	1¼	1¼
300	1¼	1¼	1½
400	1¼	1½	2
500	1½	1½	2
600	1½	2	2
700	2	2	2
800	2	2	3
900	2	2	3
1,000	2	2	3

*Vent lines of 50 ft., 100 ft., and 200 ft. of pipe plus 7 ells.

TABLE H-12 – Maximum allowable size of containers and portable tanks

Container type	Flammable liquids			Combustible liquids	
	Class IA	Class IB	Class IC	Class II	Class III
Glass or approved plastic	1 pt	1 qt	1 gal	1 gal	1 gal.
Metal (other than DOT drums)	1 gal	5 gal	5 gal	5 gal	5 gal.
Safety cans	2 gal	5 gal	5 gal	5 gal	5 gal.
Metal drums (DOT spec.)	60 gal	60 gal	60 gal	60 gal	60 gal.
Approved portable tanks	660 gal	660 gal	660 gal	660 gal	660 gal.

Container exemptions: (a) Medicines, beverages, foodstuffs, cosmetics, and other common consumer items, when packaged according to commonly accepted practices, shall be exempt from the requirements of § 1910.106 (d) (2) (i) and (ii).

TABLE H-13 – Storage in inside rooms

Fire protection* provided	Fire resistance	Maximum size	Total allowable quantities (gals./sq. ft./floor area)
Yes	2 hours	500 sq. ft.	10
No	2 hours	500 sq. ft.	4
Yes	1 hour	150 sq. ft.	5
No	1 hour	150 sq. ft.	2

*Fire protection system shall be sprinkler, water spray, carbon dioxide, or other system.

TABLE H-14 – Indoor container storage

Class liquid	Storage level	Protected storage maximum per pile	Unprotected storage maximum per pile
		Gallons	Gallons
IA	Ground and upper floors	2,750 (50)	660 (12)
	Basement	Not permitted	Not permitted
IB	Ground and upper floors	5,500 (100)	1,375 (25)
	Basement	Not permitted	Not permitted
IC	Ground and upper floors	16,500 (300)	4,125 (75)
	Basement	Not permitted	Not permitted
II	Ground and upper floors	16,500 (300)	4,125 (75)
	Basement	5,500 (100)	Not permitted
III	Ground and upper floors	55,000 (1,000)	13,750 (250)
	Basement	8,250 (450)	Not permitted

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

NOTE 2: Aisles shall be provided so that no container is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

(Numbers in parentheses indicate corresponding number of 55-gal. drums.)

NOTE 3: Each pile shall be separated from each other by at least 4 ft.

TABLE H-15 – Indoor portable tank storage

Class liquid	Storage level	Protected storage maximum per pile	Unprotected storage maximum per pile
		Gallons	Gallons
IA	Ground and upper floors	Not permitted	Not permitted
	Basement	Not permitted	Not permitted
IB	Ground and upper floors	20,000	2,000
	Basement	Not permitted	Not permitted
IC	Ground and upper floors	40,000	5,500
	Basement	Not permitted	Not permitted
II	Ground and upper floors	40,000	5,500
	Basement	20,000	Not permitted
III	Ground and upper floors	60,000	22,000
	Basement	20,000	Not permitted

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage permitted in that pile shall be the smallest of the 2 or more separate maximum gallonages.

NOTE 2: Aisles shall be provided so that no portable tank is more than 12 ft. from an aisle. Main aisles shall be at least 8 ft. wide and side aisles at least 4 ft. wide.

NOTE 3: Each pile shall be separated from each other by at least 4 ft.

TABLE H-16 – Outdoor container storage

1 Class	2 Maximum per pile (see note 1)	3 Distance between piles (see note 2)	4 Distance to property line that can be built upon (see notes 3 and 4)	5 Distance to street, alley, public way (see note 4)
	gal.	*ft.*	*ft.*	*ft.*
IA	1,100	5	20	10
IB	2,200	5	20	10
IC	4,400	5	20	10
II	8,800	5	10	5
III	22,000	5	10	5

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the smallest of the 2 or more separate gallonages.

NOTE 2: Within 200 ft. of each container, there shall be a 12-ft. wide access way to permit approach of fire control apparatus.

NOTE 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

NOTE 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

TABLE H-17 – Outdoor portable tank storage

1 Class	2 Maximum per pile	3 Distance between piles	4 Distance to property line that can be built upon	5 Distance to street, alley, public way
	gal.	*ft.*	*ft.*	*ft.*
IA	2,200	5	20	10
IB	4,400	5	20	10
IC	8,800	5	20	10
II	17,600	5	10	5
III	44,000	5	10	5

NOTE 1: When 2 or more classes of materials are stored in a single pile, the maximum gallonage in that pile shall be the the smallest of the 2 or more separate gallonages.

NOTE 2: Within 200 ft. of each portable tank, there shall be a 12-ft. wide access way to permit approach of fire control apparatus.

NOTE 3: The distances listed apply to properties that have protection for exposures as defined. If there are exposures, and such protection for exposures does not exist, the distances in column 4 shall be doubled.

NOTE 4: When total quantity stored does not exceed 50 percent of maximum per pile, the distances in columns 4 and 5 may be reduced 50 percent, but not less than 3 ft.

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TABLE H-18 — Electrical equipment hazardous areas — bulk plants

Location	Class I Group D division	Extent of classified area
Tank vehicle and tank car:[1]		
Loading through open dome	1	Within 3 feet of edge of dome, extending in all directions.
	2	Area between 3 feet and 5 feet from edge of dome, extending in all directions.
Loading through bottom connections with atmospheric venting.	1	Within 3 feet of point of venting to atmosphere extending in all directions.
	2	Area between 3 feet and 5 feet from point of venting to atmosphere, extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of loading connection.
Loading through closed dome with atmospheric venting.	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet from open end of vent, extending in all directions. Also within 3 feet of edge of dome, extending in all directions.
Loading through closed dome with vapor recovery.	2	Within 3 feet of point of connection of both fill and vapor lines, extending in all directions.
Bottom loading with vapor recovery or any bottom unloading.	2	Within 3 feet of point of connections extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of connection.
Drum and container filling:		
Outdoors, or indoors with adequate ventilation.	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Outdoors, or indoors with adequate ventilation.	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent or fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Tank—Aboveground:		
Shell, ends, or roof and dike area	2	Within 10 feet from shell, ends, or roof of tank, Area inside dikes to level of top of dike.
Vent	1	Within 5 feet of open end of vent, extending in all directions.
	2	Area between 5 feet and 10 feet from open end of vent, extending in all directions.
Floating roof	1	Area above the roof and within the shell.
Pits:		
Without mechanical ventilation	1	Entire area within pit if any part is within a Division 1 or 2 classified area.
With mechanical ventilation	2	Entire area within pit if any part is within a Division 1 or 2 classified area.
Containing valves, fittings or piping, and not within a Division 1 or 2 classified area.	2	Entire pit.
Pumps, bleeders, withdrawal fittings, meters and similar devices:		
Indoors	2	Within 5 feet of any edge of such devices, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of such devices.
Outdoors	2	Within 3 feet of any edge of such devices, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of such devices.
Storage and repair garage for tank vehicles	1	All pits or spaces below floor level.
	2	Area up to 18 inches above floor or grade level for entire storage or repair garage.
Drainage ditches, separators, impounding basins.	2	Area up to 18 inches above ditch, separator or basin. Also up to 18 inches above grade within 15 feet horizontally from any edge.
Garages for other than tank vehicles	Ordinary	If there is any opening to these rooms within the extent of an outdoor classified area, the entire room shall be classified the same as the area classification at the point of the opening.
Outdoor drum storage	Ordinary	
Indoor warehousing where there is no flammable liquid transfer.	Ordinary	If there is any opening to these rooms within the extent of an indoor classified area, the room shall be classified the same as if the wall, curb or partition did not exist.
Office and rest rooms	Ordinary	

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[1] When classifying the extent of the area, consideration shall be given to the fact that tank cars or tank vehicles may be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.

H-19 — Electrical equipment hazardous areas — service stations

Location	Class I Group D division	Extent of classified area
Underground tank:		
Fill opening	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
	2	Up to 18 inches above grade level within a horizontal radius of 10 feet from a loose fill connection and within a horizontal radius of 5 feet from a tight fill connection.
Vent—Discharging upward	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet of open end of vent, extending in all directions.
Dispenser:		
Pits	1	Any pit, box or space below grade level, any part of which is within the Division 1 or 2 classified area.
Dispenser enclosure	1	The area 4 feet vertically above base within the enclosure and 18 inches horizontally in all directions.
Outdoor	2	Up to 18 inches above grade level within 20 feet horizontally of any edge of enclosure.
Indoor:		
With mechanical ventilation	2	Up to 18 inches above grade or floor level within 20 feet horizontally of any edge of enclosure.
With gravity ventilation	2	Up to 18 inches above grade or floor level within 25 feet horizontally of any edge of enclosure.
Remote pump—Outdoor	1	Any pit, box or space below grade level if any part is within a horizontal distance of 10 feet from any edge of pump.
	2	Within 3 feet of any edge of pump, extending in all directions. Also up to 18 inches above grade level within 10 feet horizontally from any edge of pump.
Remote pump—Indoor	1	Entire area within any pit.
	2	Within 5 feet of any edge of pump, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of pump.
Lubrication or service room	1	Entire area within any pit.
	2	Area up to 18 inches above floor or grade level within entire lubrication room.
Dispenser for Class I liquids	2	Within 3 feet of any fill or dispensing point, extending in all directions.
Special enclosure inside building per § 1910.106 (f) (1) (ii).	1	Entire enclosure.
Sales, storage and rest rooms	Ordinary	If there is any opening to these rooms within the extent of a Division 1 area, the entire room shall be classified as Division 1.

TABLE H-21 – American Table of Distances for Storage of Explosives as revised and approved by the Institute of Makers of Explosives, June 5, 1975

Explosives		Distances in feet when storage is barricaded
Pounds over	Pounds not over	Separation of magazines
2	5	6
5	10	8
10	20	10
20	30	11
30	40	12
40	50	14
50	75	15
75	100	16
100	125	18
125	150	19
150	200	21
200	250	23
250	300	24
300	400	27
400	500	29
500	600	31
600	700	32
700	800	33
800	900	35
900	1, 000	36
1, 000	1, 200	39
1, 200	1, 400	41
1, 400	1, 600	43
1, 600	1, 800	44
1, 800	2, 000	45
2, 000	2, 500	49
2, 500	3, 000	52
3, 000	4, 000	58
4, 000	5, 000	61
5, 000	6, 000	65
6, 000	7, 000	68
7, 000	8, 000	72
8, 000	9, 000	75
9, 000	10, 000	78
10, 000	12, 000	82
12, 000	14, 000	87
14, 000	16, 000	90
16, 000	18, 000	94
18, 000	20, 000	98
20, 000	25, 000	105
25, 000	30, 000	112
30, 000	35, 000	119
35, 000	40, 000	124
40, 000	45, 000	129
45, 000	50, 000	135
50, 000	55, 000	140
55, 000	60, 000	145
60, 000	65, 000	150
65, 000	70, 000	155
70, 000	75, 000	160
75, 000	80, 000	165
80, 000	85, 000	170
85, 000	90, 000	175
90, 000	95, 000	180
95, 000	100, 000	185
100, 000	110, 000	195
110, 000	120, 000	205
120, 000	130, 000	215
130, 000	140, 000	225
140, 000	150, 000	235
150, 000	160, 000	245
160, 000	170, 000	255
170, 000	180, 000	265
180, 000	190, 000	275
190, 000	200, 000	285
200, 000	210, 000	295
210, 000	230, 000	315
230, 000	250, 000	335
250, 000	275, 000	360
275, 000	300, 000	385

NOTE 1. "Natural barricade" means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the magazine when the trees are bare of leaves.

NOTE 2. "Artificial barricade" means an artificial mound or revetted wall of earth of a minimum thickness of three feet.

NOTE 3. "Barricaded" means that a building containing explosives is effectually screened from a magazine, building, railway, or highway, either by a natural barricade, or by an artificial barricade of such height that a straight line from the top of any sidewall of the building containing explosives to the eave line of any magazine, or building, or to a point 12 feet above the center of a railway or highway, will pass through such intervening natural or artificial barricade.

NOTE 4. When two or more storage magazines are located on the same property, each magazine must comply with the minimum distances specified from inhabited buildings, railways, and highways, and in addition, they should be separated from each other by not less than the distances shown for "Separation of Magazines," except that the quantity of explosives contained in cap magazines shall govern in regard to the spacing of said cap magazines from magazines containing other explosives. If any two or more magazines are separated from each other by less than the specified "Separation of Magazines" distances, then such two or more magazines, as a group, must be considered as one magazine, and the total quantity of explosives stored in such group must be treated as if stored in a single magazine located on the site of any magazine of the group, and must comply with the minimum of distances specified from other magazines, inhabited buildings, railways, and highways.

NOTE 5. This table applies only to the manufacture and permanent storage of commercial explosives. It is not applicable to transportation of explosives, or any handling or temporary storage necessary or incident thereto. It is not intended to apply to bombs, projectiles, or other heavily encased explosives.

TABLE H-22 – Table of Recommended Separation Distances of Ammonium Nitrate and Blasting Agents from Explosives or Blasting Agents

Donor weight		Minimum separation distance of receptor when barricaded [2] (ft.)		Minimum thickness of artificial barricades [5] (in.)
Pounds over	Pounds not over	Ammonium nitrate [3]	Blasting agent [4]	
	100	3	11	12
100	300	4	14	12
300	600	5	18	12
600	1,000	6	22	12
1,000	1,600	7	25	12
1,600	2,000	8	29	12
2,000	3,000	9	32	15
3,000	4,000	10	36	15
4,000	6,000	11	40	15
6,000	8,000	12	43	20
8,000	10,000	13	47	20
10,000	12,000	14	50	20
12,000	16,000	15	54	25
16,000	20,000	16	58	25
20,000	25,000	18	65	25
25,000	30,000	19	68	30
30,000	35,000	20	72	30
35,000	40,000	21	76	30
40,000	45,000	22	79	35
45,000	50,000	23	83	35
50,000	55,000	24	86	35
55,000	60,000	25	90	35
60,000	70,000	26	94	40
70,000	80,000	28	101	40
80,000	90,000	30	108	40
90,000	100,000	32	115	40
100,000	120,000	34	122	50
120,000	140,000	37	133	50
140,000	160,000	40	144	50
160,000	180,000	44	158	50
180,000	200,000	48	173	50
200,000	220,000	52	187	60
220,000	250,000	56	202	60
250,000	275,000	60	216	60
275,000	300,000	64	230	60

Notes to Table of Recommended Separation Distances of Ammonium Nitrate and Blasting Agents from Explosives or Blasting Agents:

NOTE 1. These distances apply to the separation of stores only. Table H-21 shall be used in determining separation distances from inhabited buildings, passenger railways, and public highways.

NOTE 2. When the ammonium nitrate and/or blasting agent is not barricaded, the distances shown in the table shall be multiplied by six. These distances allow for the possibility of high velocity metal fragments from mixers, hoppers, truck bodies, sheet metal structures, metal containers, and the like which may enclose the "donor". Where storage is in bullet-resistant magazines recommended for explosives or where the storage is protected by a bullet-resistant wall, distances, and barricade thicknesses in excess of those prescribed in Table H-21 are not required.

NOTE 3. The distances in the table apply to ammonium nitrate that passes the insensitivity test prescribed in the definition of ammonium nitrate fertilizer promulgated by the National Plant Food Institute*; and ammonium nitrate failing to pass said test shall be stored at separation distances determined by competent persons. (*Definition and Test Procedures for Ammonium Nitrate Fertilizer, National Plant Food Institute, November 1964.)

NOTE 4. These distances apply to nitrocarbo-nitrates and blasting agents which pass the insensitivity test prescribed in the U.S. Department of Transportation (DOT) regulations.

NOTE 7. Guide to use of table of recommended separation distances of ammonium nitrate and blasting agents from explosives or blasting agents.

(a) Sketch location of all potential donor and acceptor materials together with the maximum mass of material to be allowed in that vicinity. (Potential donors are high explosives, blasting agents, and combination of masses of detonating materials. Potential acceptors are high explosives, blasting agents, and ammonium nitrate.)

(b) Consider separately each donor mass in combination with each acceptor mass. If the masses are closer than table allowance (distances measured between nearest edges), the combination of masses becomes a new potential donor of weight equal to the total mass. When individual masses are considered as donors, distances to potential acceptors shall be measured between edges. When combined masses within propagating distance of each other are considered as a donor, the appropriate distance to the edge of potential acceptors shall be computed as a weighted distance from the combined masses.

Calculation of weighted distance from combined masses:

Let M_2, M_3 . . . M_n be donor masses to be combined.

M_1 is a potential acceptor mass.

D_{12} is distance from M_1 to M_2 (edge to edge).

D_{13} is distance from M_1 to M_3 (edge to edge), etc.

To find weighted distance [$D_1(_{2,3}\ldots_n)$] from combined masses to M_1, add the products of the individual masses and distances and divide the total by the sum of the masses thus:

$$D_1(_{2,3},\ldots_n)=\frac{M_2\times D_{12}+M_3\times D_{13}\ldots+M_n\times D_{1n}}{M_2+M_3\ldots+M_n}$$

Propagation is possible if either an individual donor mass is less than the tabulated distance from an acceptor or a combined mass is less than the weighted distance from an acceptor.

(c) In determining the distances separating highways, railroads, and inhabited buildings from potential explosions (as prescribed in Table H-21), the sum of all masses which may propagate (i.e., lie at distances less than prescribed in the Table) from *either* individual *or* combined donor masses are included. However, when the ammonium nitrate must be included, only 50 percent of its weight shall be used because of its reduced blast effects. In applying Table H-21 to distances from highways, railroads, and inhabited buildings, distances are measured from the nearest edge of potentially explodable material as prescribed in Table H-21, Note 5.

(d) When all or part of a potential acceptor comprises Explosives Class A as defined in DOT regulations, storage in bullet-resistant magazines is required. Safe distances to stores in bullet-resistant magazines may be obtained from the intermagazine distances prescribed in Table H-21.

(e) Barricades must not have line-of-sight openings between potential donors and acceptors which permit blast or missiles to move directly between masses.

(f) Good housekeeping practices shall be maintained around any bin containing ammonium nitrate or blasting agent. This includes keeping weeds and other combustible materials cleared within 25 feet of such bin. Accumulation of spilled product on the ground shall be prevented.

NOTE 5. Earth, or sand dikes, or enclosures filled with the prescribed minimum thickness of earth or sand are acceptable artificial barricades. Natural barricades, such as hills or timber of sufficient density that the surrounding exposures which require protection cannot be seen from the "donor" when the trees are bare of leaves, are also acceptable.

NOTE 6. When the ammonium nitrate must be counted in determining the distances to be maintained from inhabited buildings, passenger railways and public highways, it may be counted at one-half its actual weight because its blast effect is lower.

TABLE H-23 – Location of LP-Gas Containers

Water capacity per container	Minimum distances		
	Containers		Between above-ground containers
	Under-ground	Above-ground	
Less than 125 gals [1]	10 feet	None	None.
125 to 250 gallons	10 feet	10 feet	None.
251 to 500 gallons	10 feet	10 feet	3 feet.
501 to 2,000 gallons	25 feet [2]	25 feet [2]	3 feet.
2,001 to 30,000 gallons	50 feet	50 feet	5 feet.
30,001 to 70,000 gallons	50 feet	75 feet	¼ of sum of diameters of adjacent containers.
70,001 to 90,000 gallons	50 feet	100 feet	

[1] If the aggregate water capacity of a multi-container installation at a consumer site is 501 gallons or greater, the minimum distance shall comply with the appropriate portion of this table, applying the aggregate capacity rather than the capacity per container. If more than one installation is made, each installation shall be separated from another installation by at least 25 feet. Do not apply the MINIMUM DISTANCES BETWEEN ABOVEGROUND CONTAINERS to such installations.

[2] NOTE: The above distance requirements may be reduced to not less than 10 feet for a single container of 1,200 gallons water capacity or less, providing such a container is at least 25 feet from any other LP-Gas container of more than 125 gallons water capacity.

TABLE H-24 – Wall Thickness of Copper Tubing[1]

NOTE: The standard size by which tube is designated is ⅛-inch smaller than its nominal outside diameter.

Standard size (inches)	Nominal O.D. (inches)	Nominal wall thickness (inches)	
		Type K	Type L
¼	0.375	0.035	0.030
⅜	0.500	0.049	0.035
½	0.625	0.049	0.040
⅝	0.750	0.049	0.042
¾	0.875	0.065	0.045
1	1.125	0.065	0.050
1¼	1.375	0.065	0.055
1½	1.625	0.072	0.060
2	2.125	0.083	0.070

[1] Based on data in Specification for Seamless Copper Water Tube, ANSI H23.1-1970 (ASTM B-88-69).

TABLE H-25 – Wall Thickness of Aluminum Alloy Tubing[1]

Outside diameter (inches)	Nominal wall thickness (inches)	
	Type A	Type B
⅜	0.035	0.049
½	0.035	0.049
⅝	0.042	0.049
¾	0.049	0.058

[1] Based on data in Standard Specification for Aluminum-Alloy Drawn Seamless Coiled Tubes for Special Purpose Applications, ASTM B210-68.

TABLE H-26 – Safety-Relief Valve Settings for LP-Gas Containers

Containers	Minimum (percent)	Maximum (percent)
ASME Code; Par. U-68, U-69—1949 and earlier editions	110	[1] 125
ASME Code; Par. U-200, U-201—1949 edition	88	[1] 100
ASME Code—1950, 1952, 1956, 1959, 1962, 1965 and 1968 (Division I) editions	88	[1] 100
API—ASME Code—all editions	88	[1] 100
DOT—As prescribed in 49 CFR Chapter I		

[1] Manufacturers of safety relief valves are allowed a plus tolerance not exceeding 10 percent of the set pressure marked on the valve.

TABLE H-27 – Maximum Permitted Filling Density

Specific gravity at 60° F. (15.6° C.)	Aboveground containers		Underground containers, all capacities
	0 to 1,200 U.S. gals. (1,000 imp. gal., 4,550 liters) total water cap.	Over 1,200 U.S. gals. (1,000 imp. gal., 4,550 liters) total water cap.	
	Percent	*Percent*	*Percent*
0.496–0.503	41	44	45
.504–.510	42	45	46
.511–.519	43	46	47
.520–.527	44	47	48
.528–.536	45	48	49
.537–.544	46	49	50
.545–.552	47	50	51
.553–.560	48	51	52
.561–.568	49	52	53
.569–.576	50	53	54
.577–.584	51	54	55
.585–.592	52	55	56
.593–.600	53	56	57

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TABLE H-28 – Extent of Classified Areas of LP-Gas Facilities

Part	Location	Extent of classified area [1]	Equipment shall be suitable for National Electrical Code, Class 1, Group D [2]
A	Storage containers other than DOT cylinders.	Within 15 feet in all directions from connections, except connections otherwise covered in Table H-28.	Division 2.
B	Tank vehicle and tank car loading and unloading. [3]	Within 5 feet in all directions from connections regularly made or disconnected for product transfer.	Division 1.
		Beyond 5 feet but within 15 feet in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and grade. (See Figure H-1).	Division 2.
C	Gage vent openings other than those on DOT cylinders.	Within 5 feet in all directions from point of discharge.	Division 1.
		Beyond 5 feet but within 15 feet in all directions from point of discharge.	Division 2.
D	Relief valve discharge other than those on DOT cylinders.	Within direct path of discharge.	Division 1.
		Within 5 feet in all directions from point of discharge.	Division 1.
		Beyond 5 feet but within 15 feet in all directions from point of discharge except within the direct path of discharge.	Division 2.
E	Pumps, compressors, gas-air mixers and vaporizers other than direct fired.	--	
	Indoors without ventilation...	Entire room and any adjacent room not separated by a gastight partition.	Division 1.
		Within 15 feet of the exterior side of any exterior wall or roof that is not vaportight or within 15 feet of any exterior opening.	Division 2.
	Indoors with adequate ventilation. [4]	Entire room and any adjacent room not separated by a gastight partition.	Division 2.
	Outdoors in open air at or abovegrade.	Within 15 feet in all directions from this equipment and within the cylindrical volume between the horizontal equator of the sphere and grade. See Figure H-1.	Division 2.
F	Service Station Dispensing Units.	Entire space within dispenser enclosure, and 18 inches horizontally from enclosure exterior up to an elevation 4 ft. above dispenser base. Entire pit or open space beneath dispenser.	Division 1.
		Up to 18 inches abovegrade within 20 ft. horizontally from any edge of enclosure. Note: For pits within this area, see Part F of this table.	Division 2.
G	Pits or trenches containing or located beneath LP-Gas valves, pumps, compressors, regulators, and similar equipment.	--	
	Without mechanical ventilation.	Entire pit or trench................................	Division 1.
		Entire room and any adjacent room not separated by a gastight partition.	Division 2.
		Within 15 feet in all directions from pit or trench when located outdoors.	Division 2.
	With adequate mechanical ventilation.	Entire pit or trench................................	Division 2.
		Entire room and any adjacent room not separated by a gastight partition.	Division 2.
		Within 15 feet in all directions from pit or trench when located outdoors.	Division 2.

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[1] The classified area shall not extend beyond an unpierced wall, roof, or solid vaportight partition.

[2] See Subpart S of this part.

[3] When classifying extent of hazardous area, consideration shall be given to possible variations in the spotting of tank cars and tank vehicles at the unloading points and the effect these variations of actual spotting point may have on the point of connection.

[4] Ventilation, either natural or mechanical, is considered adequate when the concentration of the gas in a gas-air mixture does not exceed 25 percent of the lower flammable limit under normal operating conditions.

TABLE H-28 (continued) – Extent of Classified Areas of LP-Gas Facilities

Part	Location	Extent of classified area [1]	Equipment shall be suitable for National Electrical Code, Class 1, Group D [2]
H	Special buildings or rooms for storage of portable containers.	Entire room	Division 2.
	Pipelines and connections containing operational bleeds, drips, vents or drains.	Within 5 ft. in all directions from point of discharge.	Division 1.
		Beyond 5 ft. from point of discharge, same as Part E of this table.	
J	Container filling:		
	Indoors without ventilation.	Entire room	Division 1.
	Indoors with adequate ventilation.[4]	Within 5 feet in all directions from connections regularly made or disconnected for product transfer.	Division 1.
		Beyond 5 feet and entire room	Division 2.
	Outdoors in open air	Within 5 feet in all directions from connections regularly made or disconnected for product transfer.	Division 1.
		Beyond 5 feet but within 15 feet in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and grade. (See Figure H-1)	Division 2.

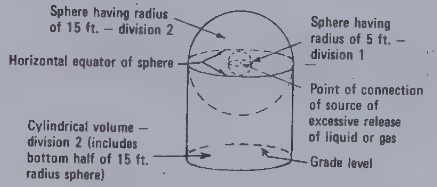
Sphere having radius of 15 ft. – division 2
Horizontal equator of sphere
Cylindrical volume – division 2 (includes bottom half of 15 ft. radius sphere)
Sphere having radius of 5 ft. – division 1
Point of connection of source of excessive release of liquid or gas
Grade level

FIGURE H-1

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[4] Ventilation, either natural or mechanical, is considered adequate when the concentration of the gas in a gas-air mixture does not exceed 25 percent of the lower flammable limit under normal operating conditions.

TABLE H-29 – Appears with "Formulas for Gaging LP-Gas Container Filling Point" on page H—App—16.

TABLE H-30 – Regulator Relief Valve Settings for LP-Gas Systems

Regulator delivery pressure	Relief valve start-to-discharge pressure setting (percent of regulator delivery pressure) Minimum	Maximum
1 p.s.i.g. or less	200	300
Above 1 p.s.i.g. but not over 3 p.s.i.g	140	200
Above 3 p.s.i.g	125	200

TABLE H-31 – Minimum Design Pressure Range for LP-Gas Storage Containers

Container type	For gases with vapor press. not to exceed lb. per sq. in. gage at 100° F. (37.8 C.)	Minimum design pressure of container lb. per sq. in. gage	
		1949 and earlier editions of ASME Code (Par. U-68, U-69)	1949 edition of ASME Code (Par. U-200, U-201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of ASME Code; All editions of API-ASME Code [2]
[1] 200	215	200	250

[1] Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designation when constructed under 1949 or earlier editions of the ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: (1) the 1949 ASME Code (Par. U-200 and U-201), (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of the ASME Code, and (3) all editions of the API-ASME Code.

[2] Construction of containers under the API-ASME Code is not authorized after July 1, 1961.

TABLE H-32 – Minimum Design Pressure Range for LP-Gas Storage Containers on LP-Gas Fueled Industrial Trucks

Container type	For gases with vapor press. Not to exceed lb. per sq. in. gage at 100° F. (37.8° C.)	Minimum design pressure of container, lb. per sq. in. gage	
		1949 and earlier editions of ASME Code (Par. U-68, U-69)	1949 edition of ASME Code (Par. U-200, U-201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of ASME Code; All editions of API-ASME Code[3]
[1] 80	[1] 80	[1] 80	[1] 100
100	100	100	125
125	125	125	156
150	150	150	187
175	175	175	219
[2] 200	215	200	250

[1] New storage containers of the 80 type have not been authorized since Dec. 31, 1947.

[2] Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designation when constructed under 1949 or earlier editions of the ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: (1) the 1949 ASME Code (Par. U-200 and U-201), (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of the ASME Code, and (3) all editions of the API-ASME Code.

[3] Construction of containers under the API-ASME Code is not authorized after July 1, 1961.

TABLE H-33 – Minimum Distances from Property for LP-Gas Storage Areas

Quantity of LP-Gas Stored:	*Distance*
500 pounds or less	0
501 to 2,500 pounds	0*
2,501 to 6,000 pounds	10 feet
6,001 to 10,000 pounds	20 feet
Over 10,000 pounds	25 feet

*Container or containers shall be at least 10 feet from any building on adjoining property, any sidewalk, or any of the exposures described in § 1910.110(f)(6)(i) (*c*) or (*d*) of this paragraph.

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TABLE H-34 – Minimum Design Pressure Range for LP-Gas Storage Containers at Liquified Petroleum Gas Services Stations

Container type	For gases with vapor pressure not to exceed lb. per sq. in. gage of 100° F. (37.8 C.)	Minimum design pressure of container, lb. per sq. in. gage	
		1949 and earlier editions of ASME Code (Par. U-68, U-69)	1949 edition of ASME Code (Par. U-200, U-201); 1950, 1952, 1956, 1959, 1962, 1965 and 1968 (Division 1) editions of ASME Code, all editions of API-ASME Code[2]
[1] 200	215	200	250

[1] Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100 percent of the container type designation when constructed under 1949 or earlier editions of the ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125 percent of the container type designation when constructed under: (1) the 1949 ASME Code (Paragraphs U-200 and U-201), (2) 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of the ASME Code, and (3) all editions of the API-ASME Code.

[2] Construction of containers under the API-ASME Code is not authorized after July 1, 1961.

(Table H-35 revoked.)

TABLE H-36 – Minimum Required Rate of Discharge in Cubic Feet Per Minute of Air at 120 Percent of the Maximum Permitted Start to Discharge Pressure for Safety Relief Valves

Surface area (sq. ft.)	*Flow rate CFM air*
20	258
25	310
30	360
35	408
40	455
45	501
50	547
55	591
60	635
65	678
70	720
75	762
80	804
85	845
90	885
95	925
100	965
105	1,010
110	1,050
115	1,090
120	1,120
125	1,160
130	1,200
135	1,240
140	1,280
145	1,310
150	1,350
155	1,390
160	1,420
165	1,460
170	1,500
175	1,530
180	1,570
185	1,600
190	1,640
195	1,670
200	1,710
210	1,780
220	1,850
230	1,920
240	1,980
250	2,050
260	2,120
270	2,180
280	2,250
290	2,320
300	2,380
310	2,450
320	2,510
330	2,570
340	2,640
350	2,700
360	2,760
370	2,830
380	2,890
390	2,950
400	3,010
450	3,320
500	3,620
550	3,910
600	4,200
650	4,480
700	4,760
750	5,040
800	5,300
850	5,590
900	5,850
950	6,120
1,000	6,380
1,050	6,640
1,100	6,900
1,150	7,160
1,200	7,410
1,250	7,660
1,300	7,910
1,350	8,160
1,400	8,410
1,450	8,650
1,500	8,900
1,550	9,140
1,600	9,380
1,650	9,620
1,700	9,860
1,750	10,090
1,800	10,330
1,850	10,560
1,900	10,800
1,950	11,030
2,000	11,260
2,050	11,490
2,100	11,720
2,150	11,950
2,200	12,180
2,250	12,400
2,300	12,630
2,350	12,850
2,400	13,080
2,450	13,300
2,500	13,520

"Surface Area=total outside surface area of container in square feet. When the surface area is not stamped on the nameplate or when the marking is not legible the area can be calculated by using one of the following formulas:

(1) Cylindrical container with hemispherical heads:

Area=overall length in feet times outside diameter in feet times 3.1416.

(2) Cylindrical container with other than hemispherical heads:

Area=(overall length in feet plus 0.8 outside diameter in feet) times outside diameter in feet times 3.1416.

(3) Spherical container:

Area=outside diameter in feet squared times 3.1416."

"Flow Rate—CFM Air=cubic feet per minute of air required at standard conditions, 60° F. and atmospheric pressure (14.7 p.s.i.a.)."

"The rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2,500 square feet, the required flow rate can be calculated using the formula: Flow Rate CFM Air=22.11 $A^{0.82}$, where A= outside surface area of the container in square feet."

Storage of Liquefied Petroleum — 1910.110(b)(10)(ii)

Minimum required rate of discharge in cubic feet per minute of air at 120 percent of the maximum permitted start to discharge pressure for safety relief valves to be used on containers for storage of liquefied petroleum gases.

Surface area (sq. ft.)	*Flow rate CFM air*
20 or less	626
25	751
30	872
35	990
40	1, 100
45	1, 220
50	1, 330
55	1, 430
60	1, 540
65	1, 640
70	1, 750
75	1, 850
80	1, 950
85	2, 050
90	2, 150
95	2, 240
100	2, 340
105	2, 440
110	2, 530
115	2, 630
120	2, 720
125	2, 810
130	2, 900
135	2, 990
140	3, 080
145	3, 170
150	3, 260
155	3, 350
160	3, 440
165	3, 530
170	3, 620
175	3, 700
180	3, 790
185	3, 880
190	3, 960
195	4, 050
200	4, 130
210	4, 300
220	4, 470
230	4, 630
240	4, 800
250	4, 960
260	5, 130
270	5, 290
280	5, 450
290	5, 610
300	5, 760
310	5, 920
320	6, 080
330	6, 230
340	6, 390
350	6, 540
360	6, 690
370	6, 840
380	7, 000
390	7, 150
400	7, 300
450	8, 040
500	8, 760
550	9, 470
600	10, 170
650	10, 860
700	11, 550
750	12, 220
800	12, 880
850	13, 540
900	14, 190
950	14, 830
1,000	15, 470
1,050	16, 100
1,100	16, 720
1,150	17, 350
1,200	17, 960
1,250	18, 570
1,300	19, 180
1,350	19, 780
1,400	20, 380
1,450	20, 980
1,500	21, 570
1,550	22, 160
1,600	22, 740
1,650	23, 320
1,700	23, 900
1,750	24, 470
1,800	25, 050
1,850	25, 620
1,900	26, 180
1,950	26, 750
2,000	27, 310

Surface area = total outside surface area of container in square feet.

When the surface area is not stamped on the nameplate or when the marking is not legible, the area can be calculated by using one of the following formulas:

(1) Cylindrical container with hemispherical heads:

Area = Overall length × outside diameter × 3.1416.

(2) Cylindrical container with other than hemispherical heads:
Area = (Overall length + 0.3 outside diameter) × outside diameter × 3.1416.

Note: This formula is not exact, but will give results within the limits of practical accuracy for the sole purpose of sizing relief valves.

(3) Spherical container:

Area = Outside diameter squared × 3.1416.
Flow Rate-CFM Air = Required flow capacity in cubic feet per minute of air at standard conditions, 60 F. and atmospheric pressure (14.7 p.s.i.a.).

The rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2,000 square feet, the required flow rate can be calculated using the formula, Flow Rate-CFM Air = 53.632 $A^{0.82}$.

A = total outside surface area of the container in square feet.

Valves not marked "Air" have flow rate marking in cubic feet per minute of liquefied petroleum gas. These can be converted to ratings in cubic feet per minute of air by multiplying the liquefied petroleum gas ratings by factors listed below. Air flow ratings can be converted to ratings in cubic feet per minute of liquefied petroleum gas by dividing the air ratings by the factors listed below.

AIR CONVERSION FACTORS

Container type	100	125	150	175	200
Air conversion factor	1. 162	1. 142	1. 113	1. 078	1. 010

Formulas for Gaging LP-Gas Container Filling Point

1910.110(b)(19)(v)(a–d)

(*a*) It is impossible to set out in a table the length of a fixed dip tube for various capacity tanks because of the varying tank diameters and lengths and because the tank may be installed either in a vertical or horizontal position. Knowing the maximum permitted filling volume in gallons, however, the length of the fixed tube can be determined by the use of a strapping table obtained from the container manufacturer. The length of the fixed tube should be such that when its lower end touches the surface of the liquid in the container, the contents of the container will be the maximum permitted volume as determined by the following formula:

$$\frac{\text{Water capacity (gals.) of container}^{*} \times \text{filling density}^{**}}{\text{Specific gravity of LP-Gas}^{*} \times \text{volume correction factor}^{\dagger} \times 100} = \text{Maximum volume of LP-Gas}$$

*Measured at 60° F.

**From subparagraph (12) of this paragraph "Filling Densities."

†For aboveground containers the liquid temperature is assumed to be 40° F. and for underground containers the liquid temperature is assumed to be 50° F. To correct the liquid volumes at these temperatures to 60° F. the following factors shall be used.

(*b*) Formula for determining maximum volume of liquefied petroleum gas for which a fixed length of dip tube shall be set:

Table H-29 — Volume Correction Factors

Specific gravity	Aboveground	Underground
0.500	1.033	1.017
.510	1.031	1.016
.520	1.029	1.015
.530	1.028	1.014
.540	1.026	1.013
.550	1.025	1.013
.560	1.024	1.012
.570	1.023	1.011
.580	1.021	1.011
.590	1.020	1.010

Example: Assume a 100-gallon total water capacity tank* for aboveground storage of propane having a specific gravity of 0.510 of 60° F.

$$\frac{100\text{ (gals.)} \times 42\text{ (filling density from subparagraph (12) of this paragraph)}}{0.510 \times 1.031\text{ (correction factor from Table H–29)} \times 100} = \frac{4200}{52.6}$$

$\frac{4200}{52.6}$ = 79.8 gallons propane, the maximum amount permitted to be placed in a 100-gallon total water capacity aboveground container equipped with a fixed dip tube.

$$\frac{\text{Maximum volume of LP-Gas (from formula in subdivision (}b\text{) of this subdivision)} \times 100}{\text{Total water content of container in gallons}} = \text{Maximum percent of LP-Gas}$$

* See also Table H-27.

(*c*) The maximum volume of LP-Gas which can be placed in a container when determining the length of the dip tube expressed as a percentage of total water content of the container is calculated by the following formula.

(*d*) The maximum weight of LP-Gas which may be placed in a container *for determining the length of a fixed dip tube* is determined by multiplying the maximum volume of liquefied petroleum gas obtained by the formula in (*b*) of this subdivision by the pounds of liquefied petroleum gas in a gallon at 40° F. for aboveground and at 50° F. for underground containers. For example, typical pounds per gallon are specified below:

	Aboveground, pounds per gallon	Underground, pounds per gallon
Propane	4.37	4.31
N Butane	4.97	4.92

APPENDIX A — SUBSTANCE DATA SHEET

Appendixes to 1910.119 -- Process Safety Management of Highly Hazardous Chemicals

Appendix A to 1910.119-- List of Highly Hazardous Chemicals, Toxics and Reactives (Mandatory)

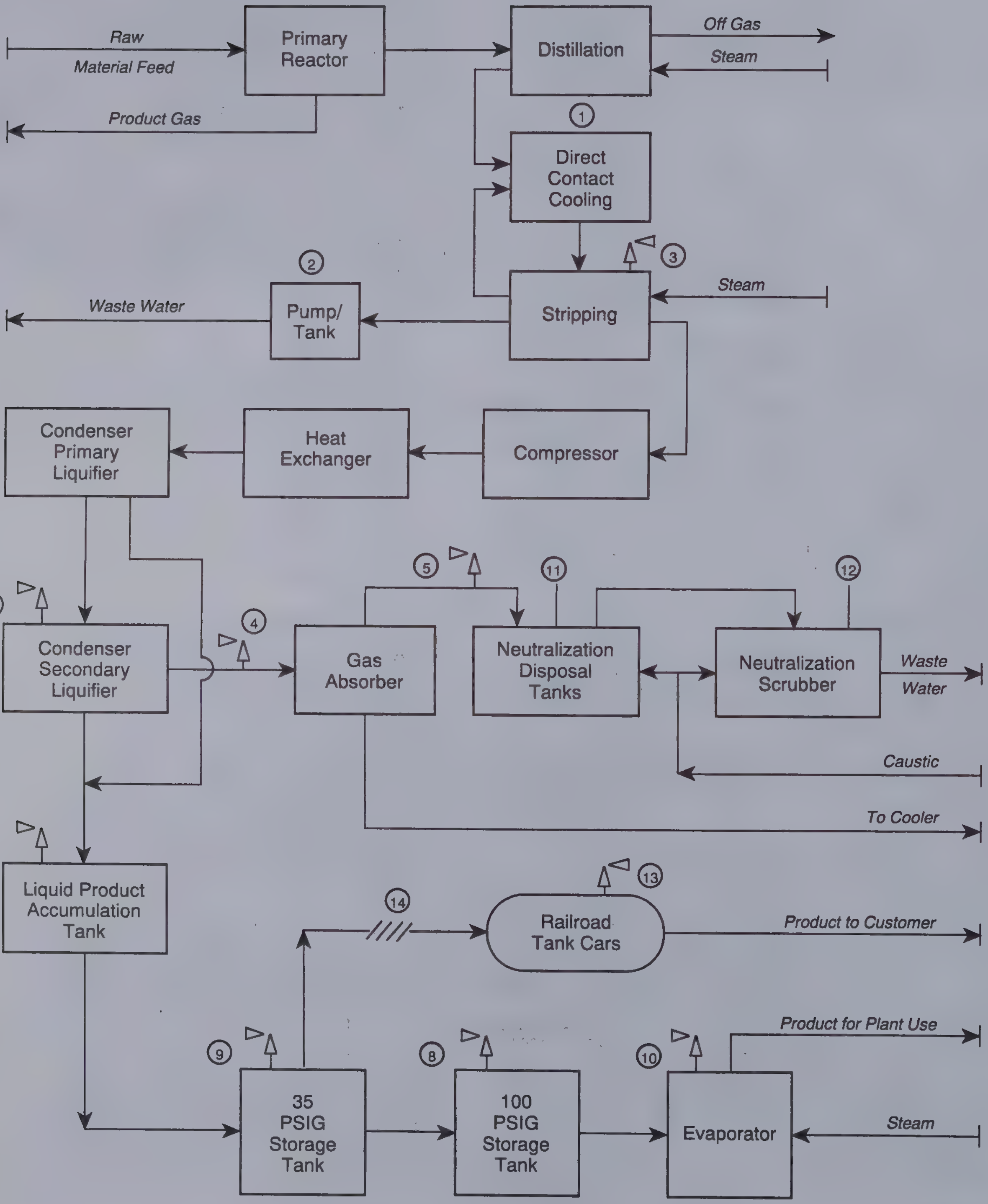
This Appendix contains a listing of toxic and reactive highly hazardous chemicals which present a potential for a catastrophic event at or above the threshold quantity.

CHEMICAL NAME	CAS*	TQ**
Acetaldehyde	75-07-0	2500
Acrolein (2-Propenal)	107-02-8	150
Acrylyl Chloride	814-68-6	250
Allyl Chloride	107-05-1	1000
Allylamine	107-11-9	1000
Alkylaluminums	Varies	5000
Ammonia, Anhydrous	7664-41-7	10000
Ammonia solutions (44% ammonia by weight)	7664-41-7	15000
Ammonium Perchlorate	7790-98-9	7500
Ammonium Permanganate	7787-36-2	7500
Arsine (also called Arsenic Hydride)	7784-42-1	100
Bis(Chloromethyl) Ether	542-88-1	100
Boron Trichloride	10294-34-5	2500
Boron Trifluoride	7637-07-2	250
Bromine	7726-95-6	1500
Bromine Chloride	13863-41-7	1500
Bromine Pentafluoride	7789-30-2	2500
Bromine Trifluoride	7787-71-5	15000
3-Bromopropyne (also called Propargyl Bromide)	106-96-7	100
Butyl Hydroperoxide (Tertiary)	75-91-2	5000
Butyl Perbenzoate (Tertiary)	614-45-9	7500
Carbonyl Chloride (see Phosgene)	75-44-5	100
Carbonyl Flouride Cellulose Nitrate (concentration 12.6% nitrogen)	9004-70-0	2500
Chlorine	7782-50-5	1500
Chlorine Dioxide	10049-04-4	1000
Chlorine Pentrafluoride	13637-63-3	1000
Chlorine Trifluoride	7790-91-2	1000
Chlorodiethylaluminum (also called Diethylaluminum Chloride)	96-10-6	5000
1-Chloro-2, 4-Dinitrobenzene	97-00-7	5000
Chloromethyl Methyl Ether	107-30-2	500
Chloropicrin	76-06-2	500
Chloropicrin and Methyl Bromide mixture	None	1500
Chloropicrin and Methyl Chloride mixture	None	1500
Cumene Hydroperoxide	80-15-9	5000
Cyanogen	460-19-5	2500
Cyanogen Chloride	506-77-4	500
Cyanuric Fluoride	675-14-9	100
Dtacetyl Peroxide (Concentration 70%)	110-22-5	5000
Diazomethane	334-88-3	500
Dibenzoyl Peroxide	94-36-0	7500
Diborane	19287-45-7	100
Dibutyl Peroxide (Tertiary)	110-05-4	5000
Dichloro Acetylene	7572-29-4	250
Dichiorosilane	4109-96-0	2500
Diethylzinc	557-20-0	10000
Diisopropyl Peroxydicarbonate	105-64-6	7500
Dilaluroyl Peroxide	105-74-8	7500
Dimethyldichlorosilane	75-78-5	1000
Diniethylhydrazina, 1,1-	57-14-7	1000
Dimethylamine, Anhydrous	124-40-3	2500
2,4-Dinitroaniline	97-02-9	5000
Ethyl Methyl Ketone Peroxide (also Methyl Ethyl Ketone Peroxide; concentration 60%)	1338-23-4	5000
Ethyl Nitrite	109-95-5	5000
Ethylamine	75-04-7	7500
Ethylene Fluorohydrin	371-62-0	100
Ethylene Oxide	75-21-8	5000
Ethyeneimine	151-56-4	1000
Fluorine	7782-41-4	1000
Formaldehyde (Formalin)	50-00-0	1000
Furan	110-00-9	500
Hexafluoroacetone	684-16-2	5000
Hydrochloric Acid, Anhydrous	7647-01-0	5000
Hydrofluoric Acid, Anhydrous	7664-39-3	1000
Hydrogen Bromide	10035-10-6	5000
Hydrogen Chloride	7647-01-0	5000
Hydrogen Cyanide, Anhydrous	74-90-8	1000
Hydrogen Fluoride	7664-39-3	1000
Hydrogen Peroxide (52% by weight or greater)	7722-84-1	7500
Hydrogen Selenide	7783-07-5	150
Hydrogen Sulfide	7783-06-4	1500
Hydroxylamine	7803-49-8	2500
Iron, Pentacarbonyl	13463-40-6	250
Isopropylamine	75-31-0	5000
Ketene	463-51-4	100
Methacrylaldehyde	78-85-3	1000
Methacryloyl Chloride	920-46-7	150
Methacryloyloxyethyl Isocyanate	30674-80-7	100
Methyl Acrylonitrile	126-98-7	250
Methylamine, Anhydrous	74-89-5	1000
Methyl Bromide	74-83-5	2500
Methyl Chloride	74-87-3	15000
Methyl Chloroformate	79-22-1	500
Methyl Ethyl Ketone Peroxide (concentration 60%)	1338-23-4	5000
Methyl Fluoroacetate	453-18-9	100
Methyl Fluorosulfate	421-20-5	100
Methyl Hydrazine	60-34-4	100
Methyl Iodide	74-88-4	7500
Methyl Isocyanate	624-83-9	250
Methyl Mercaptan	74-93-1	5000
Methyl Vinyl Ketone	79-84-4	100
Methyltrichlorosilane	75-79-6	500
Nickel Carbonyl (Nickel Tetracarbonyl)	13463-39-3	150
Nitric Acid (94.5% by weight or greater)	7697-37-2	500
Nitric Oxide	10102-43-9	250
Nitroaniline (para Nitroaniline)	100-01-6	500
Nitromethane	75-52-5	2500
Nitrogen Dioxide	10102-44-0	250
Nitrogen Oxides (NO; NO_2); N204; N203)	10102-44-0	250
Nitrogen Tetroxide (also called Nitrogen Peroxide)	10544-72-6	250
Nitrogen Trifluoride	7783-54-2	5000
Nitrogen Trioxide	10544-73-7	250
Oleum (65% to 80% by weight; also called Fuming Sulfuric Acid	8014-94-7	1000
Osmium Tetroxide	20816-12-0	100
Oxygen Difluoride (Fluorine Monoxide)	7783-41-7	100
Ozone	10028-15-6	100
Petraborane	19624-22-7	100
Peracetic Acid (concentration 60% Acetic Acid; also called Peroxyacetic Acid)	79-21-0	1000
Perchloric Acid (concentration 60% by weight)	7601-90-3	5000
Perchloromethyl Mercaptan	594-42-3	150
Perchloryl Fluoride	7616-94-6	5000
Peroxyacetic Acid (concentration 60% Acetic Acid; also called Peracetic Acid)	79-21-0	1000
Phosgene (also called Carbonyl Chloride)	75-44-5	100
Phosphine (Hydrogen Phosphide)	7803-51-2	100
Phosphorus Oxychloride (also called Phosphoryl Chloride)	10025-87-3	1000
Phosphorus Trichloride	7719-12-2	1000
Phosphoryl Chloride (also called Phosphorus Oxychloride)	10025-87-3	1000
Propargyl Bromide	106-96-7	100
Propyl Nitrate	627-3-4	2500
Sarin	107-44-8	100
Selenium Hexafluoride	7783-79-1	1000
Stibine (Antimony Hydride)	7803-52-3	500
Sulfur Dioxide (liquid)	7446-09-5	1000
Sulfur Pentafluoride	5714-22-7	250
Sulfur Tetrafluoride	7783-60-0	250
Sulfur Trioxide (also called Sulfuric Anhydride)	7446-11-9	1000
Sulfuric Anhydride (also called Sulfur Trioxide)	7446-11-9	1000
Tellurium Hexafluoride	7783-80-4	250
Tetrafluoroethylene	116-14-3	5000
Tetrafluorohydrazine	10036-47-2	5000
Tetramethyl Lead	75-74-1	1000
Thionyl Chloride	7719-09-7	250
Trichloro (chloromethyl) Silane	1558-25-4	100
Trichloro (dichlorophenyl) Silane	27137-85-5	2500
Trichlorosilane	10025-78-2	5000
Trifluorochloroethylene	79-38-9	10000
Trimethyoxysilane	2487-90-3	1500

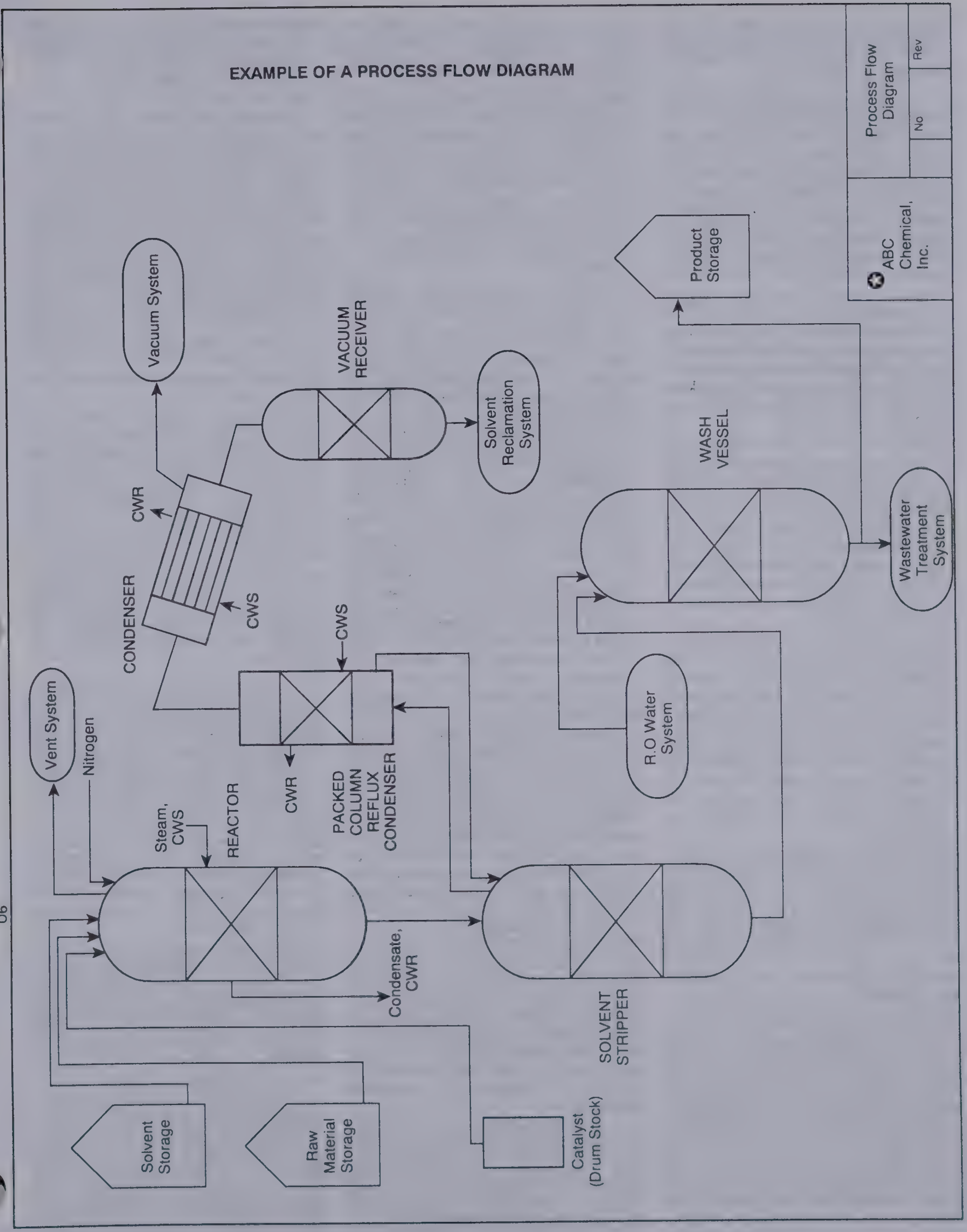
*Chemical Abstract Service Number.

**Threshold Quantity in Pounds (Amounts necessary to be covered by this standard).

EXAMPLE OF A BLOCK FLOW DIAGRAM



EXAMPLE OF A PROCESS FLOW DIAGRAM



Appendix C to 1910.1192 — Compliance Guidelines and Recommendations for Process Safety Management (Nonmandatory)

This appendix serves as a nonmandatory guideline to assist employers and employees in complying with the requirements of this section, as well as provides other helpful recommendations and information. Examples presented in this appendix are not the only means of achieving the performance goals in the standard. This appendix neither adds nor detracts from the requirements of the standard.

1. Introduction to Process Safety Management.

The major objective of process safety management of highly hazardous chemicals is to prevent unwanted releases of hazardous chemicals especially into locations that could expose employees and others to serious hazards.

An effective process safety management program requires a systematic approach to evaluating the whole process. Using this approach, the process design, process technology, operational and maintenance activities and procedures, nonroutine activities and procedures, emergency preparedness plans and procedures, training programs, and other elements that have an impact on the process are all considered in the evaluation.

The various lines of defense that have been incorporated into the design and operation of the process to prevent or mitigate the release of hazardous chemicals need to be evaluated and strengthened to assure their effectiveness at each level. Process safety management is the proactive identification, evaluation and mitigation or prevention of chemical releases that could occur as a result of failures in process, procedures or equipment.

The process safety management standard targets highly hazardous chemicals that have the potential to cause a catastrophic incident. This standard as a whole is to aid employers in their efforts to prevent or mitigate episodic chemical releases that could lead to a catastrophe in the workplace and possibly to the surrounding community.

To control these types of hazards, employers need to develop the necessary expertise, experiences, judgment and proactive initiative within their workforce to properly implement and maintain an effective process safety management program as envisioned in the OSHA standard.

This OSHA standard is required by the Clean Air Act Amendments as is the Environmental Protection Agency's Risk Management Plan. Employers, who merge the two sets of requirements into their process safety management program, will better assure full compliance with each as well as enhancing their relationship with the local community.

While OSHA believes process safety management will have a positive effect on the safety of employees in workplaces and offers other potential benefits to employers (increased productivity), smaller businesses which may have limited resources available to them at this time, might consider alternative avenues of decreasing the risks associated with highly hazardous chemicals at their workplaces.

One method which might be considered is the reduction in the inventory of the highly hazardous chemical. This reduction in inventory will result in a reduction of the risk or potential for a catastrophic incident. Also, employers including small employers may be able to establish more efficient inventory control by reducing the quantities of highly hazardous chemicals on site below the established threshold quantities. This reduction can be accomplished by ordering smaller shipments and maintaining the minimum inventory necessary for efficient and safe operation. When reduced inventory is not feasible, then the employer might consider dispersing inventory to several locations on site. Dispersing storage into locations where a release in one location will not cause a release in another location is a practical method to also reduce the risk or potential for catastrophic incidents.

2. Employee Involvement in Process Safety Management.

Section 304 of the Clean Air Act Amendments states that employers are to consult with their employees and their representatives regarding the employer's efforts in the development and implementation of the process safety management program elements and hazard assessments. Section 304 also requires employers to train and educate their employees and to inform affected employees of the findings from incident investigations required by the process safety management program.

Many employers, under their safety and health programs, have already established means and methods to keep employees and their representatives informed about relevant safety and health issues and employers may be able to adapt these practices and procedures to meet their obligations under this standard.

Employers who have not implemented an occupational safety and health program may wish to form a safety and health committee of employees and management representatives to help the employer meet the obligations specified by this standard. These committees can become a significant ally in helping the employer to implement and maintain an effective process safety management program for all employees.

3. Process Safety Information.

Complete and accurate written information concerning process chemicals, process technology, and process equipment is essential to an effective process safety management program and to a process hazards analysis. The compiled information will be a necessary resource to a variety of users including the team that will perform the process hazards analysis as required under paragraph (e); those developing the training programs and the operating procedures; contractors whose employees will be working with the process; those conducting the pre-startup reviews; local emergency preparedness planners; and insurance and enforcement officials.

The information to be compiled about the chemicals, including process intermediates, needs to be comprehensive enough for an accurate assessment of the fire and explosion characteristics, reactivity hazards, the safety and health hazards to workers, and the corrosion and erosion affects on the process equipment and monitoring tools. Current material safety data sheet (MSDS) information can be used to help meet this requirement which must be supplemented with process chemistry information including runaway reaction and over pressure hazards, if applicable.

Process technology information will be a part of the process safety information package and it is expected that it will include diagrams of the type shown in Appendix B of this section as well as employer established criteria for maximum inventory levels for process chemicals; limits beyond which would be considered upset conditions; and a qualitative estimate of the consequences or results of deviation that could occur if operating beyond the established process limits. Employers are encouraged to use diagrams which will help users understand the process.

A block flow diagram is used to show the major process equipment and interconnecting process flow lines and show flow rates, stream composition, temperatures and pressures when necessary for clarity. The block flow diagram is a simplified diagram.

Process flow diagrams are more complex and will show all main flow streams, including valves, to enhance the understanding of the process; and pressures and temperatures on all feed and product lines within all major vessels, in and out of headers and heat exchangers, and points of pressure and temperature control. Also, materials of construction information, pump capacities and pressure heads, compressor horsepower and vessel design pressures and temperatures are shown when necessary for clarity. In addition, major components of control loops are usually shown along with key utilities on process flow diagrams.

Piping and instrument diagrams (P&Ids) may be the more appropriate type of diagrams to show some of the above details and to display the information for the piping designer and engineering staff. The P&IDs are to be used to describe the relationships between equipment and instrumentation as well as other relevant information that will enhance clarity. Computer software programs which do P&Ids or other diagrams useful to the information package, may be used to help meet this requirement.

The information pertaining to process equipment design must be documented. In other words, what codes and standards were relied on to establish good engineering practice. These codes and standards are published by such organizations as the American Society of Mechanical Engineers, American Petroleum Institute, American National Standards Institute, National Fire Protection Association, American Society for Testing and Materials, National Board of Boiler and Pressure Vessel Inspectors, National Association of Corrosion Engineers, American Society of Exchange Manufacturers Association, and model building code groups.

In addition, various engineering societies issue technical reports which impact process design. For example, the American Institute of Chemical Engineers has published technical reports on topics such as two phase flow for venting devices. This type of technically recognized report would constitute good engineering practice.

For existing equipment design and constructed many years ago in accordance with the codes and standards available at that time and no longer in general use today, the employer must document which codes and standards were used and that the design and construction along with the testing, inspection and operation are still suitable for the intended use. Where the process technology requires a design which departs from the applicable codes and standards, the employer must document that the design and construction is suitable for the intended purpose.

4. Process Hazard Analysis.

A process hazard analysis (PHA), sometimes called a process hazard evaluation, is one of the most important elements of the process safety management program. A PHA is an organized and systematic effort to identify and analyze the significance of potential hazards associated with the processing or handling of highly hazardous chemicals. A PHA provides information to assist employers and employees in making decisions for improving safety and reducing the consequences of unwanted or unplanned releases of hazardous chemicals. A PHA is directed toward analyzing potential causes and consequences of fires, explosions, releases of toxic or flammable chemicals and major spills of hazardous chemicals.

The PHA focuses on equipment, instrumentation, utilities, human actions (routine and nonroutine), and external factors that might impact the process. These considerations assist in determining the hazards and potential failure points or failure modes in a process.

The selection of a PHA methodology or technique will be influenced by many factors including the amount of existing knowledge about the process. Is it a process that has been operated for a long period of time with little or no innovation and extensive experience has been generated with its use? Or, is it a new process or one which has been changed frequently by the inclusion of innovative features? Also, the size and complexity of the process will influence the decision as to the appropriate PHA methodology to use.

All PHA methodologies are subject to certain limitations. For example, the checklist methodology works well when the process is very stable and no changes are made, but it is not as effective when the process has undergone extensive change. The checklist may miss the most recent changes and consequently the changes would not be evaluated. Another limitation to be considered concerns the assumptions made by the team or analyst. The PHA is dependent on good judgment and the assumptions made during the study need to be documented and understood by the team and reviewer and kept for a future PHA.

The team conducting the PHA needs to understand the methology to be used. A PHA team can vary in size from two people to a number of people with varied operational and technical backgrounds. Some team members may only be a part of the team for a limited time. The team leader needs to be fully knowledgeable in the proper implementation of the PHA methodology that is to be used and should be impartial in the evaluation.

The other full-time or part-time team members need to provide the team with expertise in areas such as process technology; process design; operating procedures and practices, including how the work is actually performed; alarms; emergency procedures; instrumentation; maintenance procedures; both routine and nonroutine tasks, including how the tasks are authorized; procurement of parts and supplies; safety and health; and any other relevant subject as the need dictates. At least one team member must be familiar with the process.

The ideal team will have an intimate knowledge of the standards, codes, specifications and regulations applicable to the process being studied. The selected team members need to be compatible and the team leader needs to be able to manage the team and the PHA study. The team needs to be able to work together, while benefiting from the expertise of others on the team or outside the team, to resolve issues and to forge a consensus on the find of the study and recommendations.

The application of a PHA to a process may involve the use of different methodologies for various parts of the process. For example, a process involving a series of unit operations of varying sizes, complexities, and ages may use different methodologies and team members for each operation. Then the conclusions can be integrated into one final study and evaluation.

More specific examples are the use of a checklist PHA for a standard boiler or heat exchanger and the use of a Hazard and Operability PHA for the overall process. Also, for batch type processes like custom batch operations, a generic PHA of a representative batch may be used where there are only small changes of monomer or other ingredient ratios and the chemistry is documented for the full range and ratio of batch ingredients.

A generic type of PHA could be used for a gas plant. Often these plants are simply moved from site to site and therefore, a generic PHA may be used for these movable plants. Also, when an employer has several similar size gas plants and no sour gas is being processed at the site, then a generic PHA is feasible as long as the variations of the individual sites are accounted for in the PHA. Finally, when an employer has a large continuous process which has several control rooms for different portions of the process such as for a distillation tower and a blending operation, the employer may wish to do each segment separately and then integrate the final results.

Additionally, small businesses that are covered by this rule, will often have processes that have less storage volume and capacity and are less complicated than processes at a large facility. Therefore, OSHA would anticipate that the less complex methodologies would be used to meet the process hazard analysis criteria in the standard. These process hazard analyses can be done in less time and with a few people being involved. A less complex process generally means that less data, P&IDs and process information are needed to perform a process hazard analysis.

Many small businesses have processes

that are not unique, such as cold storage lockers or water treatment facilities. Where employer associations have a number of members with such facilities a generic PHA, evolved from a checklist or what-if questions, could be developed and used effectively by each employer to reflect his/her particular process. This would simplify compliance for them.

When the employer has a number of processes which require a PHA, the employer must establish a priority system of which PHAs to conduct first. A preliminary or gross hazard analysis may be useful in prioritizing the processes that the employer has determined are subject to coverage by the process safety management standard.

Consideration should first be given to those processes with the potential of adversely affecting the largest number of employees. This prioritization should consider the potential severity of a chemical release, the number of potentially affected employees, the operating history of the process such as the frequency of chemical releases, the age of the process and any other relevant factors.

These factors would suggest a ranking order and would suggest either using a weighing factor system or a systematic ranking method. The use of a preliminary hazard analysis would assist an employer in determining which process should be of the highest priority and thereby the employer would obtain the greatest improvement in safety at the facility.

Detailed guidance on the content and application of process hazard analysis methodologies is available from the American Institute of Chemical Engineers' Center for Chemical Process Safety (see appendix D).

5. Operating Procedures and Practices.

Operating procedures describe tasks to be performed, data to be recorded, operating conditions to be maintained, samples to be collected, and safety and health precaution to be taken. The procedures need to be technically accurate, understandable to employees, and revised periodically to ensure that they reflect current operations.

The process safety information package is to be used as a resource to better assure that the operating procedures and practices are consistent with the known hazards of the chemicals in the process and that the operating parameters are accurate. Operating procedures should be reviewed by engineering staff and operating personnel to ensure that they are accurate and provide practical instructions on how to actually carry out job duties safely.

Operating procedures will include specific instructions or details on what steps are to be taken or followed in carrying out the stated procedures. These operating instructions for each procedure should include the applicable safety precautions and should contain appropriate information on safety implications. For example, the operating procedures addressing operating parameters will contain operating instructions about pressure limits, temperature ranges, flow rates, what to do when an upset condition occurs, what alarms and instruments are pertinent if an upset condition occurs, and other subjects.

Another example of using operating instructions to properly implement operating procedures is in starting up or shutting down the process. In these cases, different parameters will be required from those of nominal operation. These operating instructions need to clearly indicate the distinctions between startup and normal operations such as the appropriate allowances for heating up a unit to reach the normal operating parameters. Also the operating instructions need to describe the proper method for increasing the temperature of the unit until the normal operating temperature parameters are achieved.

Computerized process control systems add complexity to operating instructions. These operating instructions need to describe the logic of the software as well as the relationship between the equipment and the control system, otherwise it may not be apparent to the operator.

Operating procedures and instructions are important for training operating personnel. The operating procedures are often viewed as the standard operating practices (SOPs) for operations. Control room personnel and operating staff, in general, need to have a full understanding of operating procedures. If workers are not fluent in English then procedures and instructions need to be prepared in a second language understood by the workers.

In addition, operating procedures need to be changed when there is a change in the process as a result of the management of change procedures. The consequences of operating procedure changes need to be fully evaluated and the information conveyed to the personnel. For example, mechanical changes to the process made by the maintenance department (like changing a valve from steel to brass or other subtle changes) need to be evaluated to determine if operating procedures and practices also need to be changed.

All management of change actions must be coordinated and integrated with current operating procedures and operating personnel must be oriented to the changes in procedures before the change is made. When the process is shut down in order to make a change, then the operating procedures must be updated before startup of the process.

Training in how to handle upset conditions must be accomplished, as well as, what operating personnel are to do in emergencies such as when a pump seal fails or a pipeline ruptures. Communication between operating personnel and workers performing work within the process area, such as nonroutine tasks, also must be maintained. The hazards of the tasks are to be conveyed to operating personnel to accordance with established procedures and to those performing the actual tasks. When the work is completed, operating personnel should be informed to provide closure on the job.

6. Employee Training.

All employees, including maintenance and contractor employees, involved with highly hazardous chemicals need to fully understand the safety and health hazards of the chemicals and processes they work with for the protection of themselves, their fellow employees and the citizens of nearby communities. Training conducted in compliance with 1910.1200, the Hazard Communication standard, will help employees to be more knowledgeable about the chemicals they work with as well as familiarize them with reading and understanding MSDS.

Additional training in subjects such as operating procedures and safety work practices, emergency evacuation and response, safety procedures, routine and nonroutine work authorization activities, and other areas pertinent to process safety and health will need to be covered by an employer's training program.

In establishing their training programs, employers must clearly define the employees to be trained and what subjects are to be covered in their training. When establishing their training program, employers will need to clearly establish the goals and objectives they wish to achieve with the training that they provide to their employees.

The learning goals or objectives should be written in clear measurable terms before the training begins. These goals and objectives need to be tailored to each of the specific training modules or segments. Employers should describe the important actions and conditions under which the employee will demonstrate competence or knowledge as well as what is acceptable performance.

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Hands-on-training where employees are able to use their senses, beyond listening, will enhance learning. For example, operating personnel who will work in a control room or at control panels would benefit by being trained at a simulated control panel or panels. Upset conditions of various types could be displayed on the simulator and then the employee could go through the proper operating procedures to bring the simulator panel back to the normal operating parameters.

A training environment could be created to help the trainee feel the full reality of the situation but, of course, under controlled conditions. This realistic type of training can be very effective in teaching employees correct procedures while allowing them to also see the consequences of what might happen if they do not follow established operating procedures.

Other training techniques using videos or on-the-job training can be very effective for teaching other job tasks, duties or other important information. An effective training program will allow the employee to fully participate in the training process and to practice their skill or knowledge.

Employers need to periodically evaluate their training programs to see if the necessary skills, knowledge, and routines are being properly understood and implemented by their trained employees. The means or methods for evaluating the training should be developed along with the training program, goals and objectives. Training program evaluation will help employers to determine the amount of training their employees understood, and whether the desired results were obtained.

If, after the evaluation, it appears that the trained employees are not at the level of knowledge and skill that was expected, the employer will need to revise the training program, provide retraining, or provide more frequent refresher training sessions until the deficiency is resolved. Those who conducted the training and those who received the training should also be consulted as to how best to improve the training process.

If there is a language barrier, the language, known to the trainees should be used to reinforce the training messages and information.

Careful consideration must be given to assure that employees including maintenance and contract employees receive current and updated training. For example, if changes are made to a process, impacted employees must be trained in the changes and understand the effects of the changes on their job tasks (e.g., any new operating procedures pertinent to their tasks). Additionally, as already discussed, the evaluation of the employee's absorption of training will certainly influence the need for training.

7. Contractors.

Employers who use contractors to perform work in and around processes that involve highly hazardous chemicals will need to establish a screening process so that they hire and use contractors who accomplish the desired job tasks without compromising the safety and health of employees at a facility. For contractors whose safety performance on the job is not known to the hiring employer, the employer will need to obtain information on injury, illness rates and experience and should obtain contractor references. Additionally, the employer must assure that the contractor has the appropriate job skills, knowledge and certifications (such as for pressure vessel welders). Contractor work methods and experiences should be evaluated. For example, does the contractor conducting demolition work swing loads over operating processes or does the contractor avoid such hazards?

Maintaining a site injury and illness log for contractors is another method employers must use to track and maintain current knowledge of work activities involving contract employees working on or adjacent to covered processes. Injury and illness logs of both the employer's employees and contract employees allow an employer to have full knowledge of process injury and illness experience. This log will also contain information which will be of use to those auditing process safety management compliance and those involved In incident investigations.

Contract employees must perform their work safely. Considering that contractors often perform very specialized and potentially hazardous tasks such as confined space entry activities and nonroutine repair activities it is quite important that their activities be controlled while they are working on or near a covered process. A permit system or work authorization system for these activities would also be helpful to all affected employers.

The use of a work authorization system keeps an employer informed of contract employee activities, and as a benefit the employer will have better coordination and more management control over the work being performed in the process area. A well-run and well-maintained process where employee safety is fully recognized will benefit all of those who work in the facility whether they be contract employees or employees of the owner.

8. Pre-Startup Safety.

For new processes, the employer will find a PHA helpful in improving the design and construction of the process from a reliability and quality point of view. The safe operation of the new process will be enhanced by making use of the PHA recommendations before final installations are completed.

P&IDs are to be completed along with having the operating procedures in place and the operating staff trained to run the process before startup. The initial startup procedures and normal operating procedures need to be fully evaluated as part of the pre-startup review to assure a safe transfer into the normal operating mode for meeting the process parameters.

For existing processes that have been shutdown for turnaround (or modification, etc.), the employer must assure that any changes other than "replacement in kind" made to the process during shutdown go through the management of change procedures P&IDs will need to be updated as necessary as well as operating procedures and instructions. If the changes made to the process during shutdown are significant and impact the training program, then operating personnel as well as employees engaged in routine and nonroutine work in the process area may need some refresher or additional training in light of the changes. Any incident investigation recommendations, compliance audits or PHA recommendations need to be reviewed as well to see what impact they may have on the process before beginning the startup.

9. Mechanical Integrity.

Employers will need to review their maintenance programs and schedules to see if there are areas where "breakdown" maintenance is used rather than an ongoing mechanical integrity program. Equipment used to process, store, or handle highly hazardous chemicals needs to be designed, constructed, installed and maintained to minimize the risk of releases of such chemicals. This requires that a mechanical integrity program be in place to assure the continued integrity of process equipment.

Elements of a mechanical integrity program include the identification and categorization of equipment and instrumentation, inspections and tests, testing and inspection frequencies, development of maintenance procedures, trailing of maintenance personnel, the establishment of criteria for acceptable test results, documentation of test and inspection results, and documentation of manufacturer recommendations as to mean time to failure for equipment and instrumentation.

The first line of defense an employer has available is to operate and maintain the process as designed, and to keep the chemicals contained. This line of defense is backed up by the next line of defense which is the controlled release of chemicals through venting to scrubbers or flares, or to surge or overflow tanks which are designed to receive such chemicals, etc. These lines of defense are the primary lines of defense or means to prevent unwanted releases.

The secondary lines of defense would include fixed fire protection systems (sprinklers, water spray or deluge systems, monitor guns, etc.), dikes, designed drainage systems, and other systems which would control or mitigate hazardous chemicals once an unwanted release occurs. These primary and secondary lines of defense are what the mechanical integrity program needs to protect and strengthen where appropriate.

The first step of an effective mechanical integrity program is to compile and categorize a list of process equipment and instrumentation for inclusion in the program. This list would include pressure vessels, storage tanks, process piping, relief and vent systems, fire protection system components, emergency shutdown systems and alarms and interlocks and pumps.

For the categorization of instrumentation and the listed equipment, the employer would prioritize which pieces of equipment require closer scrutiny than others. Mean time to failure of various instrumentation and equipment parts would be known from the manufacturers' data or the employer's experience with the parts, which would then influence the inspection and testing frequency and associated procedures. Also, applicable codes and standards such as the National Board Inspection Code, or those from the American Society for Testing and Material, American Petroleum Institute, National Fire Protection Association, American National Standards Institute, American Society of Mechanical Engineers, and other groups, provide information to help establish an effective testing and inspection frequency. as well as appropriate methodologies.

The applicable codes and standards provide criteria for external inspections for such items as foundation and supports, anchor bolts, concrete or steel supports, guy wires, nozzles and sprinklers, pipe hangers, grounding connections, protective coatings and insulation, and external metal surfaces of piping and vessels. etc. These codes and standards also provide information on methodologies for internal inspection, and a frequency formula based on the corrosion rate of the materials of construction.

Also, both internal and external erosion needs to be considered along with corrosion effects for piping and valves. Where the corrosion rate is not known, a maximum inspection frequency is recommended, and methods of developing the corrosion rate are available in the codes. Internal inspections need to cover items such as vessel shell, bottom and head; metallic linings; nonmetallic linings; thickness measurements for vessels and piping; inspection for erosion, corrosion, cracking and bulges; internal equipment like trays, baffles, sensors and screens for erosion, corrosion or cracking and other deficiencies.

Some of these inspections may be performed by state or local government inspectors under state and local statutes. However, each employer needs to develop procedures to ensure that tests and inspections are conducted properly and that consistency is maintained even where different employees may be involved.

Appropriate training is to be provided to maintenance personnel to ensure they understand the preventive maintenance program procedures, safe practices, and the proper use and application of special equipment or unique tools that may be required. This training is part of the overall training program called for in the standard.

A quality assurance system is needed to help ensure that the proper materials of construction are used, that fabrication and inspection procedures are proper, and that installation procedures recognize field installation concerns. The quality assurance program is an essential part of the mechanical integrity program and will help to maintain the primary and secondary lines of defense that have been designed into the process to prevent unwanted chemical releases or those which control or mitigate a release.

"As built" drawings, together with certifications of coded vessels and other equipment and materials of construction need to be verified and retained in the quality assurance documentation.

Equipment installation jobs need to be properly inspected in the field for use of proper materials and procedures and to assure that qualified craftsmen are used to do the job. The use of appropriate gaskets, packing, bolts, valves, lubricants and welding rods need to be verified in the field. Also procedures for installation of safety devices need to be verified, such as the torque on the bolts on ruptured disc installations, uniform torque on flange bolts, proper installation of pump seals, etc.

If the quality of parts is a problem, it may be appropriate to conduct audits of the equipment supplier's facilities to better assure proper purchases of required equipment which is suitable for its intended service. Any changes in equipment that may become necessary will need to go through the management of change procedures.

10. Nonroutine Work Authorizations.

Nonroutine work which is conducted in process areas needs to be controlled by the employer in a consistent manner. The hazards identified involving the work that is to be accomplished must be communicated to those doing the work and to those operating personnel whose work could affect the safety of the process.

A work authorization notice or permit must have a procedure that describes the steps the maintenance supervisor, contractor representative or other person needs to follow to obtain the necessary clearance to start the job. The work authorization procedures need to reference and coordinate, when applicable, the following: lockout/tagout procedures, line breaking procedures, confined space entry procedures and hot work authorizations.

This procedure also needs to provide clear steps to follow once the job is completed in order to provide closure for those that need to know the job is completed and equipment can be returned to normal.

11. Managing Change.

To properly manage changes to process chemicals, technology, equipment and facilities, one must define what is meant by change. In this process safety management standard, change includes all modifications to equipment, procedure, raw materials and processing conditions other than "replacement in kind".

These changes need to be properly managed by identifying and reviewing them prior to implementation of the change. For example, the operating procedures contain the operating parameters (pressure limits, temperature ranges, flow rates, etc.) and the importance of operating within these limits. While the operator must have the flexibility to maintain safe operation within the established parameters, any operation outside of these parameters requires review and approval by a written management of change procedure.

"Management of change" covers changes in process technology and changes to equipment and instrumentation. Changes in process technology can result from changes in production rates, raw materials, experimentation, equipment unavailability, new equipment, new product development, change in catalyst and changes in operating conditions to improve yield or quality. Equipment changes include a change in materials of construction, equipment specifications, piping pre-arrangements, experimental equipment, computer program revisions and changes in alarms and interlocks. Employers need to establish means and methods to detect both technical changes and mechanical changes.

Temporary changes have caused a number of catastrophes over the years, and employers need to establish ways to detect temporary changes as well as those that are permanent. It is important that a time limit for temporary changes be established and monitored since, without control, these changes may tend to become permanent.

Temporary changes are subject to the management of change provisions. In addition, the management of change procedures are used to insure that the equipment and procedures are returned to their original or designed conditions at the end of the temporary change. Proper documentation and review of these changes is invaluable in assuring that the safety and health considerations are being incorporated into the operating procedures and the process.

Employers may wish to develop a form or clearance sheet to facilitate the processing of changes through the management of change procedures. A typical change form may include a description and the purpose of the change, the technical basis for the change, safety and health considerations, documentation of changes for the operating procedures, maintenance procedures, inspection and testing, P&IDs, electrical classification, training and communications, pre-startup inspection, duration of a temporary change, approvals and authorization.

Where the impact of the change is minor and well understood, a check list reviewed by an authorized person with proper communication to others who are affected may be sufficient. However, for a more complex or significant design change, a hazard evaluation procedure with approvals by operations, maintenance, and safety departments may be appropriate.

Changes in documents such as P&IDs, raw materials, operating procedures, mechanical integrity electrical classifications, etc., need to be noted so that these revisions can be made permanent when the drawings and procedure manuals are updated. Copies of process changes need to be kept in an accessible location to ensure that design changes are available to operating personnel as well as to PHA team members when a PHA is being completed or updated.

12. Investigation of Incidents.

Incident investigation is the process of identifying the underlying causes of incidents and implementing steps to prevent similar events from occurring. The intent of an incident investigation is for employers to learn, from past experiences and thus avoid repeating past mistakes.

The incidents for which OSHA expects employers to become aware and to investigate are the types of events which result in or could reasonably have resulted in a catastrophic release. Some of the events are sometimes referred to as "near misses" meaning that a serious consequence did not occur, but could have.

Employers need to develop in-house capability to investigate incidents that occur in their facilities. A team needs to be assembled by the employer and trained in the techniques of investigation including how to conduct interviews of witnesses, needed documentation and report-writing.

A multi-disciplinary team is better able to gather the facts of the event and to analyze them and develop plausible scenarios as to what happened and why. Team members should be selected on the basis of their training, knowledge and ability to contribute to a team effort to fully investigate the incident. Employees in the process area where the incident occurred should be consulted, interviewed or made a member of the team. Their knowledge of the events form a significant set of facts about the incident which occurred. The report, its findings and recommendations are to be shared with those who can benefit from the information.

The cooperation of employees is essential to an effective incident investigation. The focus of the investigation should be to obtain facts and not to place blame. The team and the investigation process should clearly deal with all involved individuals in a fair, open and consistent manner.

13. Emergency Preparedness.

Each employer must address what actions employees are to take when there is an unwanted release of highly hazardous chemicals. Emergency preparedness or the employer's secondary and tertiary (third) lines of defense are those that will be relied on when the primary lines of defense, which are used to prevent an unwanted release, fail to stop the release.

Employers will need to decide the following:

- If they want employees to handle and stop small or minor incidental releases.
- Whether they wish to mobilize the available resources at the plant and have them brought to bear on a more significant release.
- Whether employers want their employees to evacuate the danger area and promptly escape to a preplanned safe zone area, and allow the local community emergency response organizations to handle the release.
- Or whether the employer wants to use some combination of these actions.

Employers will need to select how many different emergency preparedness or tertiary lines of defense they plan to have aid, develop the necessary plans and procedures, appropriately train employees in their emergency duties and responsibilities, and then implement lines of defense.

Employers at a minimum must have an emergency action plan which will facilitate the prompt evacuation of employees due to an unwanted release of a highly hazardous chemical. This means that the employer will have a plan that will be activated by an alarm system to alert employees when to evacuate and that employees who are physically impaired will have the necessary support and assistance to get them to the safe zone as well.

The intent of these requirements is to alert and move employees to a safe zone quickly. Delaying alarms or confusing alarms are to be avoided. The use of process control centers or similar process buildings in the process area as safe areas is discouraged. Recent catastrophes have shown that a large life loss has occurred in these structures because of where they have been located and because they are necessarily designed to withstand overpressures from shockwaves resulting from explosions in the process area.

Unwanted incidental releases of highly hazardous chemicals in the process area must be addressed by the employer as to what actions employees are to take. If the employer wants employees to evacuate the area, then the emergency action plan will be activated. For outdoor processes where wind direction is important for selecting the safe route to a refuge area, the employer should place a wind direction indicator such as a wind sock or pennant at the highest point that can be seen throughout the process area. Employees can move in the direction of cross wind to upwind to gain safe access to the refuge area by knowing the wind direction.

If the employer wants specific employees in the release area to control or stop the minor emergency or incidental release, these actions must be planned in advance and procedures developed and implemented. Preplanning for handling incidental releases for minor emergencies in the process area needs to be done, appropriate equipment for the hazards must be provided, and training conducted for those employees who will perform the emergency work before they respond to handle an actual release. The employer's training program, including the Hazard Communication standard training is to address the training needs for employees who are expected to handle incidental or minor releases.

Preplanning for releases that are more serious than incidental releases is another important line of defense to be used by the employer. When a serious release of a highly hazardous chemical occurs, the employer through preplanning will have determined in advance what actions employees are to take.

The evacuation of the immediate release area and other areas as necessary would be accomplished under the emergency action plan. If the employer wishes to use plant personnel such as a fire brigade, spill control team, a hazardous materials team, or use employees to render aid to those in the immediate release area and control or mitigate the incident, these actions are covered by 1910.120, the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard.

If outside assistance is necessary, such as through mutual aid agreements between employers or local government emergency response organizations, these emergency responders are also covered by HAZWOPER. The safety and health protections required for emergency responders are the responsibility of their employers and of the on-scene incident commander.

Responders may be working under very hazardous conditions and therefore the objective is to have them competently led by an on-scene incident commander and the commander's staff, properly equipped to do their assigned work safely, and fully trained to carry out their duties safely before they respond to an emergency. Drills, training exercises, or simulations with the local community emergency response planners and responder organizations is one means to obtain better preparedness. This close cooperation and coordination between plant and local community emergency preparedness managers will also aid the employer In complying with the Environmental Protection Agency's Risk Management Plan criteria.

During emergencies, one effective way for medium to large facilities to enhance coordination and communication between on-plant operations and local community organizations is for employers to establish and equip an emergency control center. The emergency control center would be located in a safe zone area so that it could be occupied throughout the duration of an emergency. The center would serve as the major communication link between the on-scene incident commander and plant or corporate management as well as local community officials.

The communication equipment in the emergency control center should include a network to receive and transmit information by telephone, radio or other means. It is important to have a backup communication network in case of power failure or if one communication means fails.

The center should also be equipped with the plant layout and community maps, utility drawings including fire water, emergency lighting, appropriate reference materials such as a government agency notification list, company personnel phone list, SARA Title III reports and material safety data sheets, emergency plans and procedures manual, a listing with the location of emergency response equipment, mutual aid information, and access to meteorological or weather condition data and any dispersion modeling data.

14. Compliance Audits.

Employers need to select a trained individual or assemble a trained team of people to audit the process safety management system and program. A small process or plant may need only one knowledgeable person to conduct an audit.

The audit is to include an evaluation of the design and effectiveness of the process safety management system and a field inspection of the safety and health conditions and practices to verify that the employer's systems are effectively implemented. The audit should be conducted or lead by a person knowledgeable in audit techniques and who is impartial towards the facility or area being audited. The essential elements of an audit program include planning, staffing, conducting the audit, evaluation and corrective action, follow-up and documentation.

Planning in advance is essential to the success of the auditing process. Each employer needs to establish the format, staffing, scheduling and verification methods prior to conducting the audit. The format should be designed to provide the lead auditor with a procedure or checklist which details the requirements of each section of the standard. The names of the audit team members should be listed as part of the format as well.

The checklist, if properly designed, could serve as the verification sheet which provides the auditor with the necessary information to expedite the review and assure that no requirements of the standard are omitted. This verification sheet format could also identify those elements that will require evaluation or a response to correct deficiencies. This sheet could also be used for developing the follow-up and documentation requirements.

The selection of effective audit team members is critical to the success of the program. Team members should be chosen for their experience, knowledge and training. They should be familiar with the processes and with auditing techniques, practices and procedures.

The size of the team will vary depending on the size and complexity of the process under consideration. For a large, complex, highly instrumented plant, it may be desirable to have team members with expertise in process engineering and design, process chemistry, instrumentation and computer controls, electrical hazards and classifications, safety and health disciplines, maintenance, emergency preparedness, warehousing or shipping, and process safety auditing.

The team may use part-time members to provide for the depth of expertise required as well as for what is actually done or followed, compared to what is written.

An effective audit includes a review of the relevant documentation and process safety information, inspection of the physical facilities, and interviews with all levels of plant personnel. Utilizing the audit procedure and checklist developed in the preplanning stage, the audit team can systematically analyze compliance with the provisions of the standard and any other corporate policies that are relevant.

For example, the audit team will review all aspects of the training program as part of the overall audit. The team will review the written training program for adequacy of content, frequency of training, effectiveness of training in terms of its goals and objectives as well as to how it fits into meeting the standard's requirements, documentation, etc.

Through interviews, the team can determine the employee's knowledge and awareness of the safety procedures, duties, rules, emergency response assignments, etc. During the inspection, the team can observe actual practices such as safety and health policies, procedures, and work authorization practices. This approach enables the team to identify deficiencies and determine where corrective actions or improvements are necessary.

An audit is a technique used to gather sufficient facts and information, including statistical information, to verify compliance with standards. Auditors should select as part of their preplanning a sample size sufficient to give a degree of confidence that the audit reflects the level of compliance with the standard.

The audit team, through this systematic analysis, should document areas which require corrective action as well as those areas where the process safety management system is effective and working in an effective manner. This provides a record of the audit procedures and findings, and serves as a baseline of operation data for future audits. It will assist future auditors in determining changes or trends from previous audits.

Corrective action is one of the most important parts of the audit. It includes not only addressing the identified deficiencies, but also planning, followup and documentation. The corrective action process normally begins with a management review of the audit findings. The purpose of this review is to determine what actions are appropriate, and to establish priorities, timetables, resource allocations and requirements and responsibilities.

In some cases, corrective action may involve a simple change in procedure or minor maintenance effort to remedy the concern. Management of change procedures need to be used, as appropriate, even for what may seem to be a minor change. Many of the deficiencies can be acted on promptly, while some may require engineering studies or indepth review of actual procedures and practices. There may be instances where no action is necessary and this is a valid response to an audit finding. All actions taken, including an explanation where no action is taken on a finding, need to be documented as to what was done and why.

It is important to assure that each deficiency identified is addressed, the corrective action to be taken noted, and the audit person or team responsible is properly documented by the employer. To control the corrective action process, the employer should consider the use of a tracking system. This tracking system might include periodic status reports shared with affected levels of management, specific reports such as completion of an engineering study, and a final implementation report to provide closure for audit findings that have been though management of change, if appropriate, and then shared with affective employees and management. This type of tracking system provides the employer with the status of the corrective action. It also provides the documentation required to verify that appropriate corrective actions were taken on deficiencies identified in the audit.

Appendix D to 1910.119 — Sources of Further Information (Nonmandatory)

1. Center for Chemical Process Safety, American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017, (212) 705-7319.
2. "Guidelines for Hazard Evaluation Procedures." American Institute of Chemical Engineers, 345 East 47th Street, New York. NY 10017.
3. "Guidelines for Technical Management of Chemical Process Safety." Center for Chemical Process Safety of the American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017.
4. "Evaluating Process Safety in the Chemical Industry." Chemical Manufacturers Association, 2501 M Street NW, Washington, DC 20037.
5. "Safe Warehousing of Chemicals." Chemical Manufacturers Association, 2501 M Street NW, Washington, DC 20037.
6. "Management of Process Hazards." American Petroleum Institute (API Recommended Practice 750), 1220 L Street NW, Washington, D.C. 20005.
7. "Improving Owner and Contractor Safety Performance." American Petroleum Institute (API Recommended Practice 2220), API, 1220 L Street N., Washington, D.C. 20005.
8. Chemical Manufacturers Association (CMA's Manager Guide), First Edition, September 1991. CMA, 2501 M Street NW, Washington, D.C. 20037.
9. "Improving Construction Safety Performance," Report A-3, The Business Roundtable. The Business Roundtable, 200 Park Avenue. New York. NY 10166. (Report includes criteria to evaluate contractor safety performance and criteria to enhance contractor safety performance).
10. "Recommended Guidelines for Contractor Safety and Health." Texas Chemical Council, 1402 Nueces Street, Austin, TX 78701-1534.
11. "Loss Prevention in the Processes Industries," Volumes I and II. Frank P. Lees, Butterworth, London, 1983.
12. "Safety and Health Program Management Guidelines," 1989. U.S. Department of Labor, Occupational Safety and Health Administration.
13. "Safety and Health Guide for the Chemical Industry," 1986, (OSHA 3091). U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue, NW, Washington, D.C. 20210.
14. "Review of Emergency Systems," June 1988. U.S. Environmental Protection Agency (EPA), Office of Solid Waste and Emergency Response, Washington. DC 20460.
15. "Technical Guidance for Hazards Analysts, Emergency Planning for Extremely Hazardous Substances," December 1987. U.S. Environmental Protection Agency (EPA), Federal Emergency Management Administration (FEMA) and U.S. Department of Transportation (DOT), Washington, DC 20460.
16. "Accident Investigation *** A New Approach," 1983. National Safety Council, 444 North Michigan Avenue, Chicago, IL 60611-3991.
17. "Fire & Explosion Index Hazard Classification Guide," 6th Edition, May 1987. Dow Chemical Company; Midland, Michigan 48674.
18. "Chemical Exposure Index," May 1988. Dow Chemical Company: Midland, Michigan 48674.

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Appendixes to § 1910.120 — Hazardous Waste Operations and Emergency Response

Note. — The following appendices serve as non-mandatory guidelines to assist employees and employers in complying with the appropriate requirements of this section.

Appendix A — Personal Protective Equipment Test Methods

This appendix sets forth the non-mandatory examples of tests which may be used to evaluate compliance with paragraphs 1910.129(g)(4) (ii) and (iii). Other tests and other challenge agents may be used to evaluate compliance.

A. Fully-Encapsulated Suit Pressure Test

1.0 — Scope

1.1 This practice measures the ability of a gas-tight totally-encapsulating chemical protective suit material, seams, and closures to maintain fixed positive pressure. The results of this practice allow the gas-tight integrity of a total-encapsulating chemical protective suit to be evaluated.

1.2 Resistance of the suit materials to permeation, penetration, and degradation by specific hazardous substances is not determined by this test method.

2.0 — Description of Terms

2.1 Totally-encapsulated chemical protective suit (TECP suit) — A full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, and legs; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer by itself or in combination with the wearer's respiratory equipment, gloves, and boots.

2.2 Protective clothing material — Any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

2.3 ''Gas tight'' — for the purpose of this practice the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

2.4 ''Shall'' — This term indicates a mandatory requirement.

2.5 ''Should'' — This term indicates a recommendation or that which is advised but not required.

2.6 ''May'' — This term is used to state a permissive use or an alternative method to a specific requirement.

3.0 — Summary of Practice

3.1 The TECP suit is visually inspected and modified for the test. The test apparatus is attached to the suit to permit inflation to the pre-test suit expansion pressure for removal of suit wrinkles and creases. The pressure is lowered to the test pressure and monitored for three minutes. If the pressure drop is excessive, the TECP suit fails the test and is removed from service. After leak location and repair the test is repeated.

4.0 — Required Supplies

4.1 Source of compressed air,

4.2 Test apparatus for suit testing including a pressure measure device with a sensitivity of at least ¼ inch water gauge.

4.3 Vent valve closure plugs or sealing tape.

4.4 Soapy water solution and soft brush.

4.5 Stop watch or appropriate timing device.

5.0 — Safety Precautions

5.1 Care shall be taken to provide the correct pressure safety devices required for the source of compressed air used.

6.0 — Test Procedure

6.1 Prior to each test, the tester shall perform a visual inspection of the suit. Check the suit for seam integrity by visually examining the seams and gently pulling on the seams. Ensure that all air supply lines, fittings, visor, zippers, and valves are secure and show no signs of deterioration.

6.1.1 Seal off the vent valves along with any other normal inlet or exhaust points (such as umbilical air line fittings or face piece opening) with tape or other appropriate means (caps, plugs, fixture, etc.). Care should be exercised in the sealing process not to damage any of the suit components.

6.1.2 Close all closure assemblies.

6.1.3 Prepare the suit for inflation by providing an improvised connection point on the suit for connecting an airline. Attach the pressure test apparatus to the suit to permit suit inflation from a compressed air force equipped with a pressure indicating regulator. The leak tightness of the pressure test apparatus should be tested before and after each test by closing off the end of the tubing attached to the suit and assuring a pressure of three inches water gauge for three minutes can be maintained. If a component is removed for the test, that component shall be replaced and a second test conducted with another component removed to permit a complete test of the ensemble.

6.1.4 The pre-test expansion pressure (A) and the suit test pressure (B) shall be supplied by the suit manufacturer but in no case shall they be less than; A = 3 inches water gauge and B = 2 inches water gauge. the ending suit pressure (C) shall be no less than 80% (⅘) of the test pressure (B); i.e., the pressure drop shall not exceed 20% (1.5) of the test pressure (B).

6.1.5 Inflate the suit until the pressure inside is equal to pressure ''A,'' the pre-test expansion suit pressure. Allow at least one minute to fill out the wrinkles in the suit. Release sufficient air to reduce the suit pressure to pressure ''B,'' the suit test pressure. Begin timing. At the end of three minutes, record the suit pressure as pressure ''C,'' the ending suit pressure. The difference between the suit test pressure and the ending suit test pressure (B—C) shall be defined as the suit pressure drop.

6.1.6 If the suit pressure drop is more than 20 percent (⅕) of the suit test pressure B during the three minute test period, the suit fails the test and shall be removed from service.

7.0 — Retest Procedure

7.1 If the suit fails the test check for leaks by inflating the suit to pressure A and brushing or wiping the entire suit (including seams, closures, lens gaskets, glove-to-sleeve joints, etc.) with a mild soap and water solution. Observe the suit for the formation of soap bubbles, which is an indication of a leak. Repair all identified leaks.

7.2 Retest the TECP suit as outlined in test procedure 6.0

8.0 — Report

8.1 Each TECP suit tested by this practice shall have the following information recorded:

8.1.1 Unique identification number identifying brand name, date of purchase, material of construction, and unique fit features; e.g., special breathing apparatus.

8.1.2 The actual values for test pressures, A, B, and C shall be recorded along with the specific observation times. If the ending pressure (C) is less than 80% of the test pressure (B) the suit shall be identified as failing the test. When possible, the specific leak location shall be recorded as an additional test.

8.1.3 The source of the test apparatus used shall be identified and the sensitivity of the pressure gauge shall be recorded.

8.1.4 Records shall be kept for each pressure test even if repairs are being made at the test location.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.

Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

B. Fully-Encapsulated Suit Qualitative Leak Test

1.0 — Scope

1.1 this practice semi-qualitatively tests gas-tight totally-encapsulating chemical protective suit integrity by detecting inward leakage of ammonia vapor. Since no modifications are made to the suit to carry out this test, the results from this practice provide a realistic test for the integrity of the entire suit.

1.2 Resistance of the suit materials to permeation, penetration, and degradation is not determined by this test method.

2.0 — Description of Terms

2.1 totally-encapsulated chemical protective suit (TECP suit) — A full body garment which is constructed of protective clothing materials; covers the wearer's torso, head, arms, and legs; may cover the wearer's hands and feet with tightly attached gloves and boots; completely encloses the wearer by itself or in combination with the wearer's respiratory equipment, gloves, and boots.

2.2 Protective clothing material — Any material or combination of materials used in an item of clothing for the purpose of isolating parts of the body from direct contact with a potentially hazardous liquid or gaseous chemicals.

2.3 "Gas tight" — for the purpose of this practice the limited flow of a gas under pressure from the inside of a TECP suit to atmosphere at a prescribed pressure and time interval.

P11

2.4 "Shall" — This term indicates a mandatory requirement.

2.5 "Should" — This term indicates a recommendation or that which is advised but not required.

2.6 "May" — This term is used to state a permissive use or an alternative method to a specific requirement.

2.7 Intrusion Coefficient — A number expressing the level of protection provided by a gas-tight totally-encapsulating chemical protective suit. The intrusion coefficient is calculated by dividing the test room challenge agent concentration by the concentration of challenge agent found inside the suit. The accuracy of the intrusion coefficient is dependent on the challenge agent monitoring methods. The larger the intrusion coefficient the greater the protection provided by the TECP suit.

3.0 — Summary of Recommended Practice

3.1 The volume of ammonia solution required to generate the test atmosphere is determined using the directions outlined in 6.1. The suit is donned by a person wearing the appropriate respiratory equipment (normally a self-contained breathing apparatus) and worn inside the enclosed test room. The ammonia solution is taken by the suited individual into the test room and poured into an open plastic pan. A two-minute evaporation period is observed before the test room concentration is measured using a high range ammonia length of stain detector tube. When the ammonia reaches a concentration of between 1000 and 1200 ppm, the suited individual starts a standardized exercise protocol to stress and flex the suit. After this protocol is completed the test room concentration is measured again. The suited individual exits the room and his stand-by person measures the ammonia concentration inside the suit using a low range ammonia length of stain detector tube or other more sensitive ammonia detector. A stand-by person is required to observe the test individual during the test procedure, aid the person in donning and doffing the TECP suit, and monitor the suit interior. The intrusion coefficient of the suit can be calculated by dividing the average test area concentration by the interior suit concentration. A colorimetric indicator strip of bromophenol blue is placed on the inside of the suit face piece lens so that the suited individual is able to detect a color change and know if the suit has a significant leak. If a color change is observed the individual should leave the test room immediately.

4.0 — Required Supplies

4.1 A supply of concentrated ammonia (58 percent ammonium hydroxide by weight).

4.2 A supply of bromophenol/blue indicating paper, sensitive to 5-10 ppm ammonia or greater over a two-minute period of exposure.

4.3 A supply of high range (0.5-10 volume percent) and low range (5-700 ppm) detector tubes for ammonia and the corresponding sampling pump. More sensitive ammonia detectors can be substituted for the low range detector tubes to improve the sensitivity of this practice.

4.4 A plastic pan (PVC) at least 12":14":1" and a half pint plastic container (PVC) with tightly closing lid.

4.5 Volumetric measuring device of at least 50 milliliters in volume with an accuracy of at least ± 1 milliliters.

5.0 — Safety Precautions

5.1 Concentrated ammonia is a corrosive volatile liquid requiring eye, skin, and respiratory protection.

5.2 Since the threshold limit value for ammonia is 25 ppm, only persons wearing the appropriate protection shall be in the chamber. Normally only the person wearing the total-encapsulating suit will be inside the chamber. A stand-by person shall have a self-contained breathing apparatus, available to enter the test area should the suited individual need assistance.

5.3 A method to monitor the suited individual must be used during this test. Visual contact is the simplest but other methods using communication devices are acceptable.

5.4 The test room shall be large enough to allow the exercise protocol to be carried out and ventilated to allow for easy exhaust of the ammonia test atmosphere after the test(s) are completed.

5.5 Individuals shall be medically screened for the use of respiratory protection and checked for allergies to ammonia before participating in this test procedure.

6.0 — Test Procedure

6.1.1 Measure the test area to the nearest foot and calculate its volume in cubic feet. Multiply the test area volume by 0.2 milliliters of ammonia per cubic foot of test area volume to determine the approximate volume of ammonia required to generate 1000 ppm in the test area.

6.1.2 Measure this volume from the supply of concentrated ammonia and place it into a closed plastic container.

6.1.3 Place the jar, several high range ammonia detector tubes and the pump in the clean test pan and locate it near the test area entry door so that the suited individual has easy access to these supplies.

6.2.1 In a non-contaminated atmosphere, open a pre-sealed ammonia indicator strip and fasten one end of the strip to the inside of suit face shield lens where it can be seen by the wearer. Care shall be taken not to contaminate the detector part of the indicator paper by touching it. A small piece of masking tape or equivalent should be used to attach the indicator strip to the interior of the suit face shield.

6.2.2 If problems are encountered with this method of attachment the indicator strip can be attached to the outside of the respirator face piece being used during the test, assuming the face piece is worn within the TECP suit.

6.3 Don the respiratory protective device normally used with the suit; and then don the TECP suit to be tested. Check to be sure all openings which are intended to be sealed (zippers, gloves, etc.) are completely sealed. DO NOT, however, plug off any venting valves.

6.4 Step into the enclosed test room such as a closet, bathroom, or test booth, equipped with an exhaust fan. No air should be exhausted from the chamber during the test because this will dilute the ammonia challenge concentrations.

6.5 Open the container with the premeasured volume of ammonia within the enclosed test room, and pour the liquid into the empty plastic test pan. Wait two minutes to allow for adequate volatilization of the ammonia. A small mixing fan can be used near the evaporation pan to increase the evaporation rate of ammonia.

6.6 After two minutes a determination of the ammonia concentration within the chamber should be made using the high range colorimetric detector tube. A concentration of 1000 ppm ammonia or greater shall be generated before the exercises are started.

6.7 To test the integrity of the suit the following four minute exercise protocol should be followed:

6.7.1 Raising the arms above the head with at least 15 raising motions completed in one minute.

6.7.2 Walking in place for one minute with at least 15 raising motions of each leg in a one-minute period.

6.7.3 Touching the toes with at least 10 complete motions of the arms from above the head to touching to toes in a one-minute period.

6.7.4 Deep knee bends with at least 10 complete standing and squatting motions in a one-minute period.

6.8 At any time during the test should the colorimetric indicating paper change colors the test should be stopped and section 6.10 and 6.12 initiated.

6.9 After completion of the test exercise, the test area concentration should be measured again using the high range colorimetric detector tube.

6.10 Exit the test area.

6.11 The opening created by the suit zipper or other appropriate suit penetration should be used to determine the ammonia concentration in the suit with the low range length of stain detector tube or other ammonia monitor. The internal TECP suit air should be sampled far enough from the enclosed test area to prevent a false ammonia reading.

6.12 After completion of the measurement of the suit interior ammonia concentration the test is concluded and the suit is doffed and the respirator removed.

6.13 The ventilating fan for the test room should be turned on and allowed to run for enough time to remove the ammonia gas.

6.14 Any detectable ammonia in the suit interior (5 ppm NH_3 or more for the length of stain detector tube) indicates the suit fails the test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass/fail criteria.

6.15 By following this practice an intrusion coefficient of approximately 200 or more can be measured with the suit in a completely operational condition.

7.0 — Retest Procedures

7.1 If the suit fails this test check for leaks by following the pressure test in test A above.

7.2 Retest the TECP suit as outlined in the test procedure 6.0.

8.0 — Report

8.1 Each gas-tight totally-encapsulating chemical protective suit tested by this practice shall have the following information recorded.

8.1.1 Unique identification number identifying brand name, date of purchase, material of construction, and unique suit features; e.g., special breathing apparatus.

8.1.2 General description of test room used for test.

8.1.3 Brand name and purchase date of ammonia detector strips.

8.1.4 Brand name, sampling range, and expiration date of the length of stain ammonia detector tubes. The brand name and model of the sampling pump should also be recorded. If another type of ammonia detector is used, it should be identified along with its minimum detection limit for ammonia.

8.1.5 Actual test results shall list the two test area concentrations, their average, the interior suit concentration, and the calculated intrusion coefficient. Retest data shall be recorded as an additional test.

8.2 The evaluation of the data shall be specified as "suit passed" or "suit failed" and the date of the test. Any detectable ammonia (5 ppm or greater for the length of stain detector tube) in the suit interior indicates the suit fails this test. When other ammonia detectors are used, a lower level of detection is possible and it should be specified as the pass/fail criteria.

Caution

Visually inspect all parts of the suit to be sure they are positioned correctly and secured tightly before putting the suit back into service. Special care should be taken to examine each exhaust valve to make sure it is not blocked.

Care should also be exercised to assure that the inside and outside of the suit is completely dry before it is put into storage.

Appendix B — General Description and Discussion of the Levels of Protection and Protective Gear

This appendix sets forth information about personal protective equipment (PPE) protection levels which may be used to assist employers in complying with the PPE requirements of this section.

As required by the standard, PPE must be selected which will protect employees from the specific hazards which they are likely to encounter during their work onsite.

Selection of the appropriate PPE is a complex process which must take into consideration a variety of factors. Key factors involved in this process are identification of the hazards, or suspected hazards, their routes of potential hazard to employees (inhalation, skin absorption, ingestion, and eye or skin contact), and the performance of the PPE *materials* (and seams) in providing a barrier to these hazards. The amount of protection provided by PPE is material-hazard specific. That is, protective equipment materials will protect well against some hazardous substances and poorly, or not at all, against others. In many instances, protective equipment materials cannot be found which will provide continuous protection from the particular hazardous substance. In these cases the breakthrough time of the protective material should exceed the work durations, or the exposure after breakthrough must not pose a hazardous level.

Other factors in this selection process to be considered are matching the PPE to the employee's work requirements and task-specific conditions. The durability of PPE materials, such as tear strength and seam strength, in relation to the employee's tasks must be considered. The effects of PPE in relation to heat stress and task durations are a factor in selecting and using PPE. In some cases layers of PPE may be necessary to provide sufficient protection, or to protect expensive PPE inner garments, suits or equipment.

The more that is known about the hazards at the site, the easier the job of PPE selection becomes. As more information about the hazards and conditions at the site becomes available, the site supervisor can make decisions to upgrade or downgrade the level of PPE protection to match the tasks at hand.

The following are guidelines which an employer can use to begin the selection of the appropriate PPE. As noted above, the site information may suggest the use of combinations of PPE selected from the different protection levels (i.e., A, B, C, or D) as being more suitable to the hazards of the work. It should be cautioned that the listing below does not fully address the performance of the specific PPE material in relation to the specific hazards at the job site, and that PPE selection, evaluation and re-selection is an ongoing process until sufficient information about the hazards and PPE performance is obtained.

Part A. Personal protective equipment has been divided into four categories based on the degreee of protection afforded and are as follows (See Part B of this appendix for further explanation of Levels A, B, C, and D hazards):

I. *Level A* — To be selected when the greatest level of skin, respiratory, and eye protection is required.

Leval A equipment; used as appropriate:

1. Pressure-demand, full facepiece self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA, approved by the National Institute for Occupational Safety and Health (NIOSH)
2. Totally-encapsulating chemical-protective suit
3. Coveralls*
4. Long underwear*
5. Gloves, outer, chemical-resistant
6. Gloves, inner, chemical-resistant
7. Boots, chemical-resistant, steel toe and shank
8. Hard hat (under suit)*
9. Disposable protective suit, gloves and boots (Depending on suit construction, may be worn over totally-encapsulating suit)
10. Two-way radios (worn inside encapsulating suit)

*Optional, as applicable

II. *Level B* — The highest level of respiratory protection is necessary but a lesser level of skin protection is needed.

Level B equipment; used as appropriate:

1. Pressure-demand, full facepiece self-contained breathing apparatus (SCBA), or pressure-demand supplied air respirator with escape SCBA (NIOSH approved)
2. Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls)
3. Coveralls*
4. Gloves, outer, chemical-resistant
5. Gloves, inner, chemical-resistant
6. Boots, outer, chemical-resistant steel toe and shank
7. Boot-covers, outer, chemical-resistant (disposable)*
8. Hard hat
9. Two-way radios (worn inside encapsulating suit)
10. Face shield*

*Optional, as applicable

III. *Level C* — The concentration(s) and type(s) of airborne substance(s) is known and the criteria for using air purifying respirators are met.

Level C equipment; used as appropriate:

1. Full-face or half-mask, air purifying, canister-equipped respirators (NIOSH approved)
2. Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls)
3. Coverall*
4. Gloves, outer, chemcial-resistant
5. Gloves, inner, chemical-resisant
6. Boots (outer), chemical-resistant steel toe and shank
7. Boot-covers, outer, chemical-resistant (disposable)*
8. Hard hat
9. Escape mask*
10. Two-way radios (worn under outside protective clothing)

11. Face shield*

*Optional, as applicable

IV. *Level D* — A work uniform affording minimal protection: used for nuisance contamination only.

Level D equipment; used as appropriate:

1. Coveralls
2. Gloves*
3. Boots/shoes, chemical-resistant steel toe and shank
4. Boots, outer, chemcial-resistant (disposable)*
5. Safety glasses or chemical splash goggles*
6. Hard hat
7. Escape mask*
8. Face shield*

*Optional, as applicable

Part B. The types of hazards for which levels A, B, C, and D protection are appropriate are described below:

I. *Level A* — Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the intact skin,
2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible, or
3. Operations must be conducted in confined, poorly ventilated areas and the absence of conditions requiring Level A have not yet been determined.

II. Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection.

Note. — This involves atmospheres with IDLH concentrations of specific substances that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

2. The atmosphere contains less than 19.5 percent oxygen, or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the intact skin.

III. Level C protection should be used when:

1. The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin,
2. The types of air contaminants have been identified, concentrations measured, and a canister respirator is available that can remove the contaminants, and
3. All criteria for the use of air-purifying respirators are met.

IV. Level D protection should be used when:

1. The atmosphere contains no known hazard, and
2. Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

Note. — As stated before combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

Appendix C — Compliance Guidelines

1. *Occupational Safety and Health Program.* Each hazardous waste site clean-up effort will require a site-specific occupational safety and health program headed by the site coordinator or the employer's representative. The program will be designed for the protection of employees at the site. The program will need to be developed before work begins on the site and implemented as work proceeds. The program is to facilitate coordination and communications among personnel responsible for the various activities which will take place at the site. It will provide the overall means for planning and implementing the needed safety and health training and job orientation of employees, who will be working at the site. The program will provide the means for identifying and controlling worksite hazards and the means for monitoring program effectiveness. The program will need to cover the responsibilities and authority of the site coordinator for the safety and health of employees at the site, and the relationships with contractors or support services as to what each employer's safety and health responsibilities are for their employees on the site. Each contractor on the site needs to have its own safety and health program so structured that it will smoothly interface with the program of the site coordinator.

Each site safety and health program will need to include the following: (1) Policy statements of the line of authority and accountability for implementing the program, the objectives of the program and the role of the site safety and health officer or manager and staff; (2) means or methods for the development of procedures for identifying and controlling workplace hazards at the site; (3) means or methods for the development and communication to employees of the various plans, work rules, standard operating procedures and practices that pertain to individual employees and supervisors; (4) the training of supervisors and employees to develop the needed skills and knowledge to perform their work in a safe and healthful manner; (5) means to anticipate and prepare for emergency situations and; (6) information feedback to aid in evaluating the program and for improving the effectiveness of the program. The management and employees should be trying continually to improve the effectiveness of the program thereby enhancing the protection being afforded those working on the site.

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Accidents on the site should be investigated to provide information on how such occurrences can be avoided in the future. When injuries or illnesses occur on the site, they will need to be investigated to determine what needs to be done to prevent this incident from occurring again. Such information will need to be used as feedback on the effectiveness of the program and the information turned into positive steps to prevent any reoccurrence. Receipt of employee suggestions or complaints relating to safety and health issues involved with site activities is also a feedback mechanism that needs to be used effectively to improve the program and may serve in part as an evaluative tool(s).

2. *Training*. The employer is encouraged to utilize those training programs that have been recognized by the National Institute of Environmental Health Sciences through its training grants program. These training and educational programs are being developed for the employees who work directly with hazardous substances. For further information about these programs contact: National Institute of Environmental Health Sciences, P.O. Box 12233, Research Triangle Park, NC 27709.

   Training programs for emergency service organizations are available from the U.S. National Fire Academy, Emittsburg, MD and the various state fire training schools. The International Society of Fire Service Instructors, Ashland, MA is another resource.

3. *Decontamination*. Decontamination procedures should be tailored to the specific hazards of the site and will vary in complexity and number of steps, depending on the level of hazard and the employee's exposure to the hazard. Decontamination procedures and PPE decontamination methods will vary depending upon the specific substance, since one procedure or method will not work for all substances. Evaluation of decontamination methods and procedures should be performed, as necessary, to assure that employees are not exposed to hazards by reusing PPE. References in Appendix D may be used for guidance in establishing an effective decontamination program.

4. *Emergency response plans*. States, along with designated districts within the states, will be developing or have developed emergency response plans. These district and state plans are to be utilized in the emergency response plans called for in this standard. Each employer needs to assure that its emergency response plan is compatible with the local plan. In addition, the CAER program of the Chemical Manufacturers' Association (CMA) is another helpful resource in formulating an effective emergency response plan. Also the current Emergency Response Guidebook from the U.S. Department of Transportation, CMA's CHEMTREC and the Fire Service Emergency Management Handbook should be used as resources as well.

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Appendix D — References to Appendix

The following references to the Appendix may be consulted for further information on the subject of this notice:

1. OSHA Instruction DFO CPL 2.70 — January 29, 1986, *Special Emphasis Program: Hazardous Waste Sites*.
2. OSHA Instruction DFO CPL 2-2.37A — January 29, 1986, *Technical Assistance and Guidelines for Superfund and Other Hazardous Waste Site Activities*.
3. OSHA Instruction DTS CPL 2.74 — January 29, 1986, *Hazardous Waste Activity Form, OSHA 175*.
4. *Hazardous Waste Inspections Reference Manual*, U.S. Department of Labor, Occupational Safety and Health Administration, 1986.
5. Memorandum of Understanding Among the National Institute for Occupational Safety and Health, the Occupational Safety and Health Administration, the United States Coast Guard, and the United States Environmental Protection Agency, *Guidance for Worker Protection During Hazardous Waste Site Investigations and Clean-up and Hazardous Substance Emergencies*. December 18, 1980.
6. *National Priorities List*, 1st Edition, October 1984; U.S. Environmental Protection Agency, Revised periodically.
7. *The Decontamination of Response Personnel*, Field Standard Operating Procedures (F.S.O.P.) 7; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, December 1984.
8. *Preparation of a Site Safety Plan*, Field Standard Operating Procedures (F.S.O.P.) 9; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, April 1984.
9. *Standard Operating Safety Guidelines*; U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Hazardous Response Support Division, Environmental Response Team; November 1984.
10. *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG), and Environmental Protection Agency (EPA); October 1985.
11. *Protecting Health and Safety at Hazardous Waste Sites: An Overview*, U.S. Environmental Protection Agency, EPA/625/9-85/006; September 1985.

12. *Hazardous Waste Sites and Hazardous Substance Emergencies*, NIOSH Worker Bulletin, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; December 1982.

13. *Personal Protective Equipment for Hazardous Materials Incidents: A Selection Guide*; U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health; October 1984.

14. *Fire Service Emergency Management Handbook*, Federal Emergency Management Agency, Washington, DC, January 1985.

15. *Emergency Response Guidebook*, U.S. Department of Transportation, Washington, DC 1983.

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OVERVIEW: SUBPART I

PERSONAL PROTECTIVE EQUIPMENT

This section requires protective equipment to be worn wherever there is a hazardous process or environment which may cause harm to employees not wearing such equipment. Employee harm may result from the absorption of, inhalation of, or physical contact with hazards, which include electrical, radiological, chemical, thermal, and mechanical hazards.

Personal protective equipment includes eye, face, and head protection, protection of the extremities, protective clothing and respiratory equipment. Whether such equipment is provided by the employer or by the employee, the employer must in both cases ensure its adequacy, maintenance, sanitation, and use. All protective equipment must be of safe design and construction and must be maintained in a sanitary and reliable condition.

Specific sections of the standards covered in the checklist are:

Std. No.		**Page No.**
1910.132	**General requirements**	(I-01)
1910.133	**Eye and face protection**	(I-01)
1910.134	**Respiratory protection***	(I-01)
1910.135	**Occupational head protection**	(I-04)
1910.136	**Occupational foot protection**	(I-04)
1910.137	**Electrical protective devices**	(I-04)

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*See also "Basic Elements of a Respiratory Protection Program," page 5-31, Volume II

1910.132 — GENERAL REQUIREMENTS

(a) Application.

	YES	NO
As used in this checklist, protective equipment means the following: protective equipment for eyes, face, head, extremities, protective clothing, respiratory devices and protective shields and barriers. (a)		
Is protective equipment provided, used and maintained in a sanitary and reliable condition? (a)		
Is protective equipment used wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants that may be encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact? (a)		

(b) Employee-Owned Equipment.

	YES	NO
Are precautions taken by the employer to the adequacy of protective equipment provided by employees? (b)		
Are precautions taken by the employer to assure the proper maintenance and sanitation of such protective equipment by the employees? (b)		

(c) Design.

	YES	NO
Is all personal protective equipment of safe design and construction for the work to be performed? (c)		

1910.133 — EYE AND FACE PROTECTION

(a) General.

	YES	NO
Is protective eye and face equipment required where there is a reasonable probability of injury that can be prevented by such equipment? (a)(1)		
If there is a reasonable probability of injury, are provisions made to make conveniently available a type of protector suitable for the work to be performed? (a)(1)		
Are employees required to use such protection? (a)(1)		
Are precautions taken to assure that no person is knowingly subjected to a hazardous environmental condition? (a)(1)		
Are suitable eye protectors provided where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation, or a combination of these hazards? (a)(1)		
Does such protection meet the following minimum requirements:		
(i) Does it provide adequate protection against the particular hazards for which it is designed?		
(ii) Are they reasonably comfortable when worn under the designated conditions?		
(iii) Do they fit snugly and do they not unduly interfere with the movements of the wearer?		
(iv) Are they durable?		
(v) Are they capable of being disinfected?		
(vi) Are they easily cleanable?		
(vii) Are protectors kept clean and in good repair? (a)(2)		

1910.133 — EYE AND FACE PROTECTION

(a) General.

	YES	NO
Are persons whose vision requires the use of corrective lenses in spectacles, required to wear goggles or spectacles of one of the following types when eye protection is required?		
(i) Spectacles whose protective lenses provide optical correction?		
(ii) Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles?		
(iii) Goggles that incorporate corrective lenses mounted behind the protective lenses? (a)(3)		
Is every eye protector distinctly marked to facilitate identification only of the manufacturer? (a)(4)		
Where the manufacturer prescribes limitations or precautions are indicated, is such information transmitted to the user and is care taken to see that such limitations and precautions are strictly observed? (a)(5)		
Is the design, construction, testing and use of devices for eye and face protection in accordance with ANSI Z87.1-1968? (a)(6)		

1910.134 — RESPIRATORY PROTECTION

(a) Permissible Practice.

	YES	NO
Are engineering control measures provided as the primary objective of controlling occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors? (a)(1)		
When effective engineering controls are not feasible, are appropriate respirators used pursuant to the following requirements? (a)(1)		
Is a respiratory protective program established? (a)(2)		
Does such respiratory protective program include the requirements outlined in the items under 1910.134(b) of this section, which follows in normal sequence? (a)(2)		
Are employees required to use the provided respiratory protection in accordance with instructions and training received? (a)(3)		

(b) Requirements for a Minimal Acceptable Program.

	YES	NO
Is there a written standard operating procedure governing the selection and use of respirators established? (b)(1)		
Are respirators selected on the basis of hazards to which the worker is exposed? (b)(2)		
Is the user instructed and trained in the proper use of respirators and their limitations? (b)(3)		

1910.134 – RESPIRATORY PROTECTION

(b) Requirements for a Mineral Acceptable Program

	YES	NO
Are respirators regularly cleaned and disinfected? (b)(5)		
Are respirators used by more than one worker cleaned and disinfected after each use? (b)(5)		
Are respirators stored in a convenient, clean, and sanitary location? (b)(6)		
Are respirators routinely inspected during cleaning? (b)(7)		
Are worn or deteriorated parts replaced? (b)(7)		
Are respirators for emergency use such as self-contained devices, thoroughly inspected at least once a month and after each use? (b)(7)		
Is a program of appropriate surveillance of work area conditions and degree of employee exposure or stress maintained? (b)(8)		
Is there a regular inspection and evaluation to determine the continued effectiveness of the program maintained? (b)(9)		
Before persons are assigned to tasks requiring use of respirators, has it been determined that they are physically able to perform the work and use the equipment? (b)(10)		
Has the company physician determined what health and physical conditions are pertinent? (b)(10)		
Is the respirator user's medical status reviewed periodically? (b)(10)		
Are only approved or accepted respirators used? (b)(11)		
Do respirators provide adequate respiratory protection against the particular hazard for which they are designed? (b)(11)		
Are the regulations of the U.S. Department of Interior, Bureau of Mines, and the U.S. Department of Agriculture followed in respirator protection? (b)(11)		
Have all respirators been approved for the use intended by the U.S. Bureau of Mines or NIOSH? (b)(11)		

(c) Selection of Respirators.

	YES	NO
Is the selection of respirators in accordance with the American National Standards Institute, Z88.2-1969? (c)		

(d) Air Quality.

	YES	NO
Is compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration of high purity? (d)(1)		
Does oxygen meet the requirements of the United States Pharmacopoeia for medical or breathing oxygen? (d)(1)		
Does breathing air meet at least the requirements of the specification for Grade D breathing air as described in Compressed Gas Association Commodity Specification G-7.1-1966? (d)(1)		
Is the use of compressed oxygen prohibited in supplied-air respirators, or in open circuit self-contained breathing apparatus that have previously used compressed air? (d)(1)		
Are precautions taken to insure that oxygen is never used with air line respirators? (d)(1)		

1910.134 – RESPIRATORY PROTECTION

(d) Air Quality.

	YES	NO
If breathing air is supplied from cylinders, are such cylinders tested and maintained as prescribed in the Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 178)? (d)(2)(i)		
If breathing air is supplied from air compressors, is the compressor for supplying air equipped with the necessary safety and standby devices? (d)(2)(ii)		
Are breathing air-type compressors used? (d)(2)(ii)		
Are compressors constructed and situated so as to avoid entry of contaminated air into the system? (d)(2)(ii)		
Are compressors equipped with suitable inline air purifying sorbent beds and filters installed to further assure breathing air quality? (d)(2)(ii)		
Are compressors equipped with receivers of sufficient capacity to enable the respirator wearer to escape from a contaminated atmosphere in event of compressor failure? (d)(2)(ii)		
Are compressors equipped with alarms to indicate compressor failure and overheating? (d)(2)(ii)		
If the compressor is of the oil-lubricated type, does it have a high-temperature or carbon monoxide alarm, or both? (d)(2)(ii)		
If the compressor is equipped with a high-temperature alarm, is the air from the compressor frequently tested for carbon monoxide to insure that it meets the specifications in items under 1910.134(d)(1)? (d)(2)(ii)		
Are precautions taken to insure that air line couplings are not compatible with outlets for other gas systems? (d)(3)		
Are breathing gas containers marked in accordance with American National Standard Method of Marking Portable Compressed Gas Containers to Identify the Material Contained, Z48.1-1954; or Federal Specification BB-A-1034a, June 21, 1968; or Air Compressed for Breathing Purposes; or Interim Federal Specification GG-B-00675b, April 27, 1965, Breathing Apparatus, Self-Contained? (d)(4)		

(e) Use of Respirators.

	YES	NO
Have standard procedures been developed for respirator use? (e)(1)		
Do such procedures include all information and guidance necessary for their proper selection, use, and care? (e)(1)		
Do such procedures take into consideration the possible emergency and routine uses of respirators? (e)(1)		
Are provisions made that the correct respirator will be specified for each job? (e)(2)		
Is such respirator specification accomplished by a qualified individual supervising the respiratory protective program? (e)(2)		
Is the individual issuing respirators adequately instructed to insure that the correct respirator is issued? (e)(2)		

1910.134 – RESPIRATORY PROTECTION
(e) Use of Respirators.

	YES	NO
Are written procedures prepared covering safe use of respirators in dangerous atmospheres that might be encountered in normal operations or in emergencies? (e)(3)		
Are provisions made to insure that personnel will be familiar with these procedures and the available respirators? (e)(3)		
In areas where the wearer, with failure of the respirator, could be overcome by a toxic or oxygen-deficient atmosphere, is there at least one additional man assigned, and is he present? (e)(3)(i)		
If such individual is assigned, are communications maintained between both or all of the individuals present? (e)(3)(i)		
Are plans made to insure that one individual will never be affected by any likely incident? (e)(3)(i)		
Does such standby employee have the proper rescue equipment to assist the others in case of emergency? (e)(3)(i)		
When self-contained breathing apparatus or hose masks with blowers are used in atmospheres immediately dangerous to life or health, are standby men present with suitable rescue equipment? (e)(3)(ii)		
Are persons using air line respirators in atmospheres immediately hazardous to life or health equipped with safety harnesses and safety lines for lifting or removing them from hazardous atmospheres, or other and equivalent provisions made for the rescue of persons from hazardous atmospheres? (e)(3)(iii)		
Is there a standby man or men with suitable self-contained breathing apparatus at the nearest fresh air base for emergency rescue? (e)(3)(iii)		
Are frequent random inspections conducted by a qualified individual to assure that respirators are properly selected, used, cleaned and maintained? (e)(4)		
Are precautions taken to insure that the user of any respirator is properly instructed in its selection, use, and maintenance? (e)(5)		
Are both supervisors and workers so instructed by competent persons? (e)(5)		
Does such training provide the men an opportunity to handle the respirator, have it fitted properly, tests its facepiece-to-face seal, wear it in normal air for a long familiarity period, and, finally, to wear it in a test atmosphere? (e)(5)		
Does every respirator wearer receive fitting instructions? (e)(5)(i)		
Does such instruction include demonstrations and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly? (e)(5)(i)		
Are respirators prohibited from being worn when conditions prevent a good face seal, because of such conditions as a growth of beard, sideburns, a skull cap that projects under the facepiece, or temple pieces on glasses? (e)(5)(i)		
Are employees who wear dentures apprised of the fact that the absence of one or both dentures may seriously affect the fit of a facepiece? (e)(5)(i)		
Is the worker's diligence in observing these factors evaluated by periodic check? (e)(5)(i)		

1910.134 – RESPIRATORY PROTECTION
(e) Use of Respirators.

	YES	NO
Is each worker required to check the facepiece fit for proper protection? (e)(5)(i)		
Are precautions taken to insure that employees who wear glasses, when using respiratory protection, have a proper seal around the face of a full facepiece respirator? (e)(5)(ii)		
Is the wearing of contact lenses in contaminated atmospheres with a respirator prohibited? (e)(5)(ii)		
If facepieces are provided with corrective lenses as a part of the facepiece, are such lenses fitted by qualified individuals to provide good vision, comfort and a gastight seal? (e)(5)(ii)		
If corrective spectacles or goggles are required, are they worn so as not to affect the fit of the facepiece? (e)(5)(iii)		
(f) Maintenance and Care of Respirators.		
Is a program for maintenance and care of respirators adjusted to the type of plant, working conditions, and hazards involved? (f)(1)		
Does such program include the following basic services:		
(i) Inspection for defects (including a leak check);		
(ii) Cleaning and disinfecting;		
(iii) Repair;		
(iv) Storage? (f)(1)		
Is equipment properly maintained to retain its original effectiveness? (f)(1)		
Are all respirators inspected routinely before and after each use? (f)(2)(i)		
Is a respirator kept ready for emergency use inspected after each use and at least monthly to assure that it is in satisfactory working condition? (f)(2)(i)		
Is self-contained breathing apparatus inspected monthly? (f)(2)(ii)		
Are air and oxygen cylinders fully charged according to the manufacturer's instructions? (f)(2)(ii)		
Has it been determined that the regulator and warning devices function properly? (f)(2)(ii)		
Does the respirator inspection program include a check of the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and cannisters? (f)(2)(iii)		
Is rubber or elastomer parts inspected for pliability and signs of deterioration? (f)(2)(iii)		
Is a record kept of inspection dates and findings for respirators maintained for emergency use? (f)(2)(iv)		
Are respirators routinely used collected, cleaned, and disinfected as frequently as necessary? (f)(3)		
Are respirators that are maintained for emergency use cleaned and disinfected after each use? (f)(3)		
Are replacement or repairs for respirators done by experienced persons with parts designed for the respirator? (f)(4)		
Are precautions taken to insure that no attempt will be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations? (f)(4)		

1910.134 – RESPIRATORY PROTECTION
(f) Maintenance and Care of Respirators.

YES NO

Are reducing or admission valves or regulators returned to the manufacturer or to the trained technician for adjustment or repair? (f)(4)

After inspection, cleaning, and necessary repair, are respirators stored to protect against dust, sunlight, heat, extreme cold, excessive moisture or damaging chemicals? (f)(5)(i)

Are respirators that are placed at stations and work areas for emergency use quickly accessible at all times and are they stored in compartments built for the purpose? (f)(5)(i)

Are the compartments clearly marked? (f)(5)(i)

Are respirators prohibited from being stored in such places as lockers or tool boxes, unless they are in carrying cases or cartons? (f)(5)(i)

Are respirators packed or stored so that the facepiece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position? (f)(5)(ii)

(g) Identification of Gas Mask Canisters.

As a primary means of identifying gas mask canister, are there properly worded labels on the canister? (g)(1)

As a secondary means of identifying a gas mask canister, is it by an appropriate color code? (g)(1)

Are all gas mask canisters equipped with a proper label and colored in accordance with these requirements before they are placed in service? (g)(2)

Is such labeling and coloring properly maintained at all times thereafter until the canisters have completely served their purpose? (g)(2)

Are gas mask canisters marked with the appropriate name that the canister is designed for? (g)(3)(i)

In addition to the above marking, does each gas mask canister have essentially the following wording beneath the appropriate phrase on the canister label: (g)(3)(ii)

"For respiratory protection in atmospheres containing not more than ____________ percent by volume of __________

____________________________________."

(Name of atmospheric contaminant)

Are canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulates labeled with a statement of the type and degree of protection afforded by the filter? (g)(4)

Is such label affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister? (g)(4)

Is the degree of protection marked as the percent of penetration of the canister by a 0.3-micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute? (g)(4)

Does each canister have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume)? (g)(5)

Is each gas mask canister painted a distinctive color or combination of colors as indicated in Table I-1? (See Appendix.) (g)(6)

1910.134 – RESPIRATORY PROTECTION
(g) Identification of Gas Mask Canisters

YES NO

Are all colors used such that they are clearly identifiable by the user and clearly distinguishable from one another? (g)(6)

Does the color coating used offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use? (g)(6)

1910.135 – OCCUPATIONAL HEAD PROTECTION

Does all head protection meet the requirements and specifications established in ANSI Z89.1-1969?

1910.136 – OCCUPATIONAL FOOT PROTECTION

Does all safety-toe footwear for employees meet the requirements of American National Standards Institute, Z41.1-1967?

1910.137 – ELECTRICAL PROTECTIVE DEVICES

Does all rubber protective equipment for electrical workers conform to the requirements as established in the following ANSI Standards:

Item	Standard
Rubber insulating gloves	J6.6-1967
Rubber matting for use around electric apparatus	J6.7-1935 (R1962)
Rubber insulating blankets	J6.4-1970
Rubber insulating hoods	J6.2-1950 (R1962)
Rubber insulating line hose	J6.1-1950 (R1962)
Rubber insulating sleeves	J6.5-1962

TABLE I-1 – Color Coding for Gas Mask Canisters

Atmospheric contaminants to be protected against	*Colors assigned**
Acid gases	White.
Hydrocyanic acid gas	White with ½-inch green stripe completely around the canister near the bottom.
Chlorine gas	White with ½-inch yellow stripe completely around the canister near the bottom.
Organic vapors	Black.
Ammonia gas	Green.
Acid gases and ammonia gas	Green with ½-inch white stripe completely around the canister near the bottom.
Carbon monoxide	Blue.
Acid gases and organic vapors	Yellow.
Hydrocyanic acid gas and chloropicrin vapor	Yellow with ½-inch blue stripe completely around the canister near the bottom.
Acid gases, organic vapors, and ammonia gases.	Brown.
Radioactive materials, excepting tritium and noble gases.	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors.	Canister color for contaminant, as designated above, with ½-inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants	Red with ½-inch gray stripe completely around the canister near the top.

*Gray shall not be assigned as the main color for a canister designed to remove acids or vapors.

NOTE: Orange shall be used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.

OVERVIEW: SUBPART J

GENERAL ENVIRONMENTAL CONTROLS

This section ensures a clean, sanitary, and safe workplace through environmental controls such as sanitation and accident prevention signs, symbols, and tags.

The sanitation requirements apply to all permanent places of employment. These requirements include housekeeping, waste disposal, vermin control, water supply, toilet and washing facilities, and consumption and handling of food and beverages on work premises.

Section 1910.142 outlines site design, shelter specifications, and sanitation requirements for temporary labor camps. Housing built after April 3, 1980, must comply with these requirements. Housing built prior to this date must comply either with these requirements or the migrant housing standards of the Employment Training Administration (20 CFR 654.404-417). Under 1985 fiscal year appropriations, small farms having 10 or fewer employees but which maintain temporary labor camps are not exempt from OSHA regulation.

Signs are required in any work area where the failure to post a warning sign may lead to accidental injury and/or property damage. 1910.144 and 1910.145 contain requirements for color coding and design of accident prevention tags. These specifications apply to all safety signs, including danger, caution, safety instruction, and slow moving vehicle signs. Also outline are requirements for accident prevention tags, including "do not start" and biological hazard tags. Excluded are signs used to meet street and highway, railroad, and maarine regulations.

Section 1910.147 covers requirements for the control of hazardous energy, or lockout/tagout procedures, when service and/or maintenance is performed on machines or equipment.

Specific sections of the standards covered in the checklist are:

Std. No.		Page No.
1910.141	**Sanitation**	(J-01)
1910.142	**Temporary labor camps**	(J-03)
1910.144	**Safety color code for marking physical hazards**	(J-06)
1910.145	**Specifications for Accident Prevention Signs and Tags**	(J-06)
1910.146	**Permit-required confined spaces**	(J-11)
1910.147	**The control of hazardous energy (lockout/tagout)**	(J-27)

GENERAL DEFINITIONS — SUBPART J

Definitions applicable to 1910.141, Sanitation:

Lavatory. A basin or similar vessel used exclusively for washing of the hand, arms, face, and head.

Non water carriage toilet facility. A toilet facility not connected to a sewer.

Number of employees. The maximum number of employees present at any one time on a regular shift.

Personal service room. A room used for activities not directly connected with the production or service function performed by the establishment. Such activities include, but are not limited to, first-aid, medical services, dressing, showering, toilet use, washing, and eating.

Potable water. Water which meets the quality standards of the U.S. Public Health Service (42 CFR 72), or which is approved for drinking purposes by the state or local authority having jurisdiction.

Toilet facility. A fixture maintained without a toilet room for the purpose of defecation or urination, or both.

Toilet room. A room maintained within or on the premises of any place of employment, containing toilet facilities for use by employees.

Toxic material. A material in concentration or amount which exceeds the applicable limit established by a standard, such as 1910.1000 or, in the absence of an applicable standard, which is of such toxicity so as to constitute a recognized hazard that is causing or is likely to cause death or serious physical harm.

Urinal. A toilet facility maintained within a toilet room for the sole purpose of urination.

Water closet. A toilet facility maintained within a toilet room for the purpose of both defecation and urination and which is flushed with water.

Wet process. Any process or operation in a workroom which normally results in wet walking or standing places.

Definitions applicable to 1910.145, Specifications for accident prevention signs and tags:

Biological hazard or Biohazard. Those infectious agents presenting a risk of death, injury, or illness to employees.

Major message. That portion of a tag's inscription that is more specific than the signal word and that indicates the specific hazardous condition or the instruction to be communicated to the employee. Examples include "High Voltage," "Close Clearance," "Do Not Start," and "Do Not Use," or a corresponding pictograph used with a written text or alone.

1910.141 – SANITATION

YES NO

(a) General.

Scope. (a)(1)

This section applies to permanent places of employment. (a)(1)

Housekeeping. (a)(3)

Are all places of employment kept clean to the extent that the nature of the work allows? (a)(3)(i)

Is the floor of every workroom maintained in a dry condition? (a)(3)(ii)

Where wet processes are used is drainage maintained and false floors, platforms, mats, or other dry standing places provided? (a)(3)(ii)

As an alternate to the above, is appropriate waterproof footgear provided? (a)(3)(ii)

Is every floor, working place and passageway kept free of protruding nails, splinters, loose boards and unnecessary holes and openings? (a)(3)(iii)

Waste Disposal. (a)(4)

Are receptacles used for putrescible solid or liquid waste or refuse so constructed that they do not leak and may be thoroughly cleaned and maintained in a sanitary condition? (a)(4)(i)

Are such receptacles equipped with a solid, tight-fitting cover? (a)(4)(i)

Are all sweepings, solid or liquid wastes, refuse, and garbage removed in such a manner as to avoid creating a menace to health? (a)(4)(ii)

Is such removal as often as necessary or appropriate to maintain the place of employment in a sanitary condition? (a)(4)(ii)

Vermin Control. (a)(5)

Is every enclosed work place constructed, equipped, and maintained so as to prevent the entrance or harborage of rodents, insects, and other vermin? (a)(5)

Is there a continuing and effective extermination program where their presence is detected? (a)(5)

(b) Water Supply.

Potable Water. (b)(1)

Is potable water provided in all places of employment for drinking, washing of the person, cooking, washing of foods, washing of cooking or eating utensils, washing of food preparation or processing premises and personal service rooms? (b)(1)(i)

1910.141 – SANITATION

(b) Water Supply

YES NO

Are portable drinking water dispensers designed, constructed and serviced so that sanitary conditions are maintained? (b)(1)(iii)

Are such portable drinking containers capable of being closed, and are they equipped with a tap? (b)(1)(iii)

Is the use of open containers, such as barrels, pails or tanks for drinking water from which the water must be dipped or poured, prohibited? (b)(1)(v)

Is a common drinking cup and other common utensils prohibited? (b)(1)(vi)

Nonpotable Water. (b)(2)

Are all outlets for nonpotable water posted, or otherwise marked in a manner to indicate clearly that the water is unsafe and is not to be used for drinking, washing of the person, washing of food, washing of cooking or eating utensils, washing of food preparation or processing premises or personal service rooms, or for washing clothes? (b)(2)(i)

Is the construction of nonpotable water systems such as to prevent backflow or back-siphonage into a potable water system? (b)(2)(ii)

Is the use of nonpotable water prohibited for washing any portion of the person, cooking or eating utensils or clothing? (b)(2)(iii)

If nonpotable water is used for cleaning work premises other than food processing and preparation premises and personal service rooms, are precautions taken to insure that it does not contain concentration of chemicals, fecal coliform or other substances which could create unsanitary conditions or be harmful to employees? (b)(2)(iii)

(c) Toilet Facilities.

General. (c)(1)

Is Table J-1 used to determine the numbers of toilet facilities available required for each sex in a place of employment? (c)(1)(i)

Table J-1

Number of Employees	Minimum Number of Water Closets
1 to 15	1
16 to 35	2
36 to 55	3
56 to 80	4
81 to 110	5
111 to 150	6
Over 150	1 additional fixture for each additional 40 employees.

NOTE: Where toilet facilities will not be used by women, urinals may be provided instead of water closets, except that the number of water closets in such cases shall not be reduced to less than 2/3 of the minimum specified.

1910.141 – SANITATION

(c) Toilet Facilities.

YES NO

Is the number of facilities to be provided for each sex based on the number of employees for that sex for whom the facilities are furnished? (c)(1)(i)

NOTE: Where toilet rooms will be occupied by no more than one person at a time, can be locked from the inside and contain at least one water closet, separate toilet rooms for each sex are not required.

Where such single occupancy rooms have more than one toilet facility, only one such facility in each toilet room shall be counted for the purpose of Table J-1. (See page J-01)

The items above **do not** apply to mobile crews, or to normally unattended work locations, so long as employees working at these locations have transportation immediately available to nearby toilet facilities which meet the other requirements of this subparagraph. (c)(1)(ii)

Are precautions taken to insure that sewage disposal will not endanger the health of employees? (c)(1)(iii)

Construction of Toilet Rooms. (c)(2)

Does each water closet occupy a separate compartment with a door and walls or partitions between fixtures sufficiently high to ensure privacy? (c)(2)(i)

1910.141 – SANITATION

(d) Washing Facilities

YES NO

(d) Washing Facilities.

General. (d)(1)

Are washing facilities maintained in a sanitary condition? (d)(1)

Lavatories. (d)(2)

NOTE: The requirements of this subdivision **do not** apply to mobile crews, or to normally unattended work locations, if employees working at these locations have transportation readily available to nearby washing facilities. (d)(2)(i)

Is each lavatory provided with hot and cold running water or tepid running water? (d)(2)(ii)

Is hand soap or similar cleansing agents provided? (d)(2)(iii)

Are individual hand towels or sections thereof, of cloth or paper, warm air blowers, or clean individual sections of continuous cloth toweling provided? (d)(2)(iv)

Showers. (d)(3)

Whenever showers are required by a particular standard in this checklist, are such showers provided in accordance with the following items? (d)(3)(i)

Is there one shower provided for each 10 employees of each sex, or numerical fraction thereof, where required to shower during the same shift? (d)(3)(ii)

1910.141 – SANITATION

(d) Washing Facilities.

YES NO

Is body soap or other appropriate cleaning agent convenient to the shower provided as specified in the item under 1910.141(d)(2)(iii)? (d)(3)(iii)

Are showers provided with hot and cold water feeding a common discharge line? (d)(3)(iv)

Are employees who are required to use showers provided with individual clean towels? (d)(3)(v)

(e) Change Rooms.

Are change rooms provided whenever employees are required by a particular standard to wear protective clothing? (e)

Are such change rooms equipped with storage facilities for street clothes and separate storage facilities for the protective clothing? (e)

(f) Clothes Drying Facilities.

Where work clothes are provided by the employer and become wet, or are washed between shifts, are provisions made to insure that such clothing is dry before reuse? (f)

(g) Consumption of Food and Beverages on the Premises.

Application. (g)(1)

The following items apply only where employees are permitted to consume food or beverages, or both, on the premises. (g)(1)

Eating and Drinking Areas. (g)(2)

Are employees prohibited from being allowed to consume food or beverages in a toilet room, or in any area exposed to a toxic material? (g)(2)

Waste Disposal Containers. (g)(3)

Are receptacles constructed of smooth, corrosion-resistant, easily cleanable or disposable materials, provided and used for the disposal of waste food? (g)(3)

Are the number, size, and locations of such receptacles sufficient to encourage their use, and not result in overfilling? (g)(3)

Are such containers emptied at least once each working day? (g)(3)

Are such containers maintained in a clean and sanitary condition? (g)(3)

Are such receptacles provided with a solid, tight-fitting cover? (g)(3)

Sanitary Storage. (g)(4)

Is food or beverages prohibited from being stored in toilet rooms or in an area exposed to toxic material? (g)(4)

(h) Food Handling.

Are all employee food service facilities and operations carried out in accordance with sound hygienic principles? (h)

Where all or part of the food service is provided, is the food dispensed wholesome, free from spoilage, and is it processed, prepared, handled and stored in such a manner as to be protected against contamination? (h)

1910.142 – TEMPORARY LABOR CAMPS

YES NO

(a) Site.

Are all sites used for camps adequately drained? (a)(1)

Are all sites used for camps not subject to periodic flooding, nor located within 200 feet of swamps, pools, sinkholes, or other surface collections of water unless mosquito abatement control measures can be applied? (a)(1)

Is the site for the camp so located that the drainage from and through the camp will not endanger any domestic or public water supply? (a)(1)

Are all such sites graded, ditched, and rendered free from depressions in which water may become a nuisance? (a)(1)

Are the sizes of all sites adequate to prevent overcrowding of necessary structures? (a)(2)

Is the principal camp area in which food is prepared and served, and where sleeping quarters are located, at least 500 feet from any area in which livestock is kept? (a)(2)

Are the grounds and open areas surrounding the shelters maintained in a clean and sanitary condition, free from rubbish, debris, waste paper, garbage, or other refuse? (a)(3)

Whenever the camp is closed seasonally or permanently, is all garbage, manure, and other refuse collected and so disposed of as to prevent a nuisance? (a)(4)

Are all abandoned privy pits filled with earth and the grounds and buildings left in a clean and sanitary condition? (a)(4)

If privy buildings remain, are they locked or otherwise secured to prevent entrance? (a)(4)

(b) Shelter.

Is every shelter in the camp constructed in a manner which will provide protection against the elements? (b)(1)

Does each room used for sleeping purposes contain at least 50 square feet of floor space for each occupant? (b)(2)

Is a ceiling at least 7-feet high provided? (b)(2)

Are beds, cots, or bunks, and suitable storage facilities, such as wall lockers for clothing and personal articles, provided in every room used for sleeping purposes? (b)(3)

Are such beds or other similar facilities spaced not closer than 36 inches both laterally and end to end, and are they elevated at least 12 inches from the floor? (b)(3)

If double-deck bunks are used, are they spaced not less than 48 inches both laterally and end to end? (b)(3)

Is the minimum clear space between the lower and upper bunk at least 27 inches? (b)(3)

Are the use of triple-deck bunks prohibited? (b)(3)

Are the floors of each shelter constructed of wood, asphalt, or concrete? (b)(4)

Are wooden floors of smooth and tight construction? (b)(4)

Are the floors kept in good repair? (b)(4)

Are all wooden floors elevated not less than 1 foot above the ground level at all points to prevent dampness and to permit free circulation of air beneath? (b)(5)

1910.142 – TEMPORARY LABOR CAMPS
(b) Shelter.

	YES	NO
Are all living quarters provided with windows of the total of which shall be not less than one-tenth of the floor area? (b)(7)		
Is at least one-half of each window capable of being opened for purposes of ventilation? (b)(7)		
Are all exterior openings effectively screened with 16-mesh material? (b)(8)		
Are all screen doors equipped with self-closing doors? (b)(8)		
In a room where workers cook, live, and sleep, is there a minimum of 100 square feet per person provided? (b)(9)		
Are sanitary facilities provided for storing and preparing food? (b)(9)		
In camps where cooking facilities are used in common, are stoves provided in an enclosed and screened shelter? (b)(10)		
Is the ratio of stoves equal to 1 stove to 10 persons, or one stove to two families? (b)(10)		
Are sanitary facilities provided for storing and preparing food? (b)(10)		
Is all heating, cooking, and water heating equipment installed in accordance with State and local ordinances, codes, and regulations governing such installations? (b)(11)		
If a camp is used during cold weather, is adequate heating equipment provided? (b)(11)		
(c) Water Supply.		
Is an adequate and convenient water supply, approved by the appropriate health authority, provided in each camp for drinking, cooking, bathing, and laundry purposes? (c)(1)		
Are water distribution lines capable of supplying water at normal operating pressures to all fixtures for simultaneous operation? (c)(3)		
Are water outlets distributed throughout the camp in such a manner that no shelter is more than 100 feet from a yard hydrant if water is not piped to the shelters? (c)(3)		
Where water under pressure is available, is one or more drinking fountains provided for each 100 occupants or fraction thereof? (c)(4)		
Does the construction of drinking fountains comply with ANSI Standard Z4.2-1942? (c)(4)		
Are common drinking cups prohibited? (c)(4)		
(d) Toilet Facilities.		
Are toilet facilities adequate for the capacity of the camp provided? (d)(1)		
Is each toilet room located so as to be accessible without any individual passing through any sleeping room? (d)(2)		
Do toilet rooms have a window not less than 6 square feet in area opening directly to the outside area, or are they otherwise satisfactorily ventilated? (d)(2)		
Are all outside openings screened with 16-mesh material? (d)(2)		
Are fixtures, water closets, chemical toilets, or urinals prohibited from being located in a room used for other than toilet purposes? (d)(2)		

1910.142 – TEMPORARY LABOR CAMPS
(d) Toilet Facilities.

	YES	NO
Is there a toilet room located within 200 feet of the door of each sleeping room? (d)(3)		
Are privies no closer than 100 feet to any sleeping room, dining room, lunch area, or kitchen? (d)(3)		
Where the toilet rooms are shared, are separate toilet rooms provided for each sex? (d)(4)		
Are such rooms distinctly marked "for men" and "for women" by signs printed in English and in the native language of the persons occupying the camp, or marked with easily understood pictures or symbols? (d)(4)		
If the facilities for each sex are in the same building, are they separated by solid walls or partitions extending from the floor to the roof or ceiling? (d)(4)		
Where toilet facilities are shared, are the number of water closets or privy seats provided for each sex based on the maximum number of persons of that sex which the camp is designed to house at any one time? (d)(5)		
Are the toilet facilities in the ratio of one such unit to each 15 persons, with a minimum of two units for any shared facility? (d)(5)		
Are urinals provided on the basis of one unit or 2 linear feet or urinal trough for each 25 men? (d)(6)		
Is the floor from the wall and for a distance not less than 15 inches measured from the outside edge of the urinals constructed of materials impervious to moisture? (d)(6)		
Where water under pressure is available, are urinals provided with an adequate water flush? (d)(6)		
Do urinal troughs in privies drain freely into the pit or vault and is the construction of this drain such as to exclude flies and rodents from the pit? (d)(6)		
Is each water closet installed on or after August 31, 1971, located in a toilet room? (d)(7)		
Is each toilet room lighted naturally, or artificially by a safe type of lighting at all hours of the day and night? (d)(8)		
Is there an adequate supply of toilet paper provided in each privy, water closet, or chemical toilet compartment? (d)(9)		
Are precautions taken to insure that privies and toilet rooms are kept in a sanitary condition? (d)(10)		
Are privies and toilet rooms cleaned at least daily? (d)(10)		
(e) Sewage Disposal Facilities.		
Where public sewers are available in camps, are all sewer lines and floor drains connected thereto? (e)		
(f) Laundry, Handwashing, and Bathing Facilities.		
Is the following ratio used in providing laundry, handwashing, and bathing facilities:		
(i) One handwash basin per family shelter or per six persons in shared facilities?		
(ii) One showerhead for every 10 persons?		
(iii) A laundry tray or tub for every 30 persons?		
(iv) Slop sink in each building used for laundry, handwashing, and bathing? (f)(1)		
Are floors of a smooth finish but not constructed of slippery materials? (f)(2)		

1910.142 – TEMPORARY LABOR CAMPS

(f) Laundry, Handwashing, and Bathing Facilities.

YES NO

Are floors impervious to moisture? (f)(2)

Are floor drains provided in all shower baths, shower rooms, or laundry rooms? (f)(2)

Are all junctions of the curbing and the floor coved? (f)(2)

Are the walls and partitions of shower rooms smooth and impervious to the height of the splash? (f)(2)

Is an adequate supply of hot and cold running water provided for bathing and laundry purposes? (f)(3)

Are facilities for heating water provided? (f)(3)

Is every service building provided with equipment capable of maintaining a temperature of at least 70°F. during cold weather? (f)(4)

Are facilities for drying clothes provided? (f)(5)

Are provisions made to insure that all service buildings are kept clean? (f)(6)

(g) Lighting.

Where electric service is available, is each habitable room in a camp provided with at least one ceiling-type light fixture and at least one separate floor- or wall-type convenience outlet? (g)

Where electric service is available, are laundry and toilet rooms and rooms where people congregate provided with at least one ceiling- or wall-type fixture? (g)

Are light levels in toilet and storage rooms at least 20 foot-candles 30 inches from the floor? (g)

In other rooms, including kitchens and living quarters, are there at least 30 foot-candles 30 inches from the floor? (g)

(h) Refuse Disposal.

Are fly-tight, rodent-tight, impervious, cleanable or single service containers, approved by the appropriate health authority provided for the storage of garbage? (h)(1)

Is there at least one such container provided for each family shelter, and is it located within 100 feet of each shelter on a wooden, metal, or concrete stand? (h)(1)

Are provisions made to insure that garbage containers are kept clean? (h)(2)

Are garbage containers emptied when full, but at least twice a week? (h)(3)

(i) Construction and Operation of Kitchens, Dining Hall, and Feeding Facilities.

In all camps where central dining or multiple family feeding operations are permitted or provided, do the food handling facilities comply with the requirements of the "Food Service Sanitation Ordinance and Code," Part V of the "Food Service Sanitation Manual," U.S. Public Health Service Publication 934 (1965)? (i)(1)

Is there a properly constructed kitchen and dining hall adequate in size provided in connection with all food handling facilities? (i)(2)

Is such kitchen and dining hall separate from the sleeping quarters of any of the workers or their families? (i)(2)

Are there no direct openings from the living or sleeping quarters into a kitchen or dining hall? (i)(2)

1910.142 – TEMPORARY LABOR CAMPS

(j) Construction and Operation of Kitchens, Dining Hall, and Feeding Facilities.

YES NO

Are precautions taken to insure that no persons with any communicable disease will be employed or permitted to work in the preparation, cooking, serving, or other handling of food, foodstuffs, or materials used therein? (i)(3)

(j) Insect and Rodent Control.

Are effective measures taken to prevent infestation by and harborage or animal or insect vectors or pests? (j)

(k) First Aid.

Are adequate first aid facilities that are approved by a health authority maintained and made available in every labor camp for the emergency treatment of injured persons? (k)(1)

Are such facilities in charge of a person trained to administer first aid, and are they readily accessible for use at all times? (k)(2)

(l) Reporting Communicable Disease.

Are provisions made to insure that the camp superintendent will report immediately to the local health officer the name and address of any individual in the camp known to have or suspected of having a communicable disease? (l)(1)

Are provisions made whereby the camp superintendent will report immediately to the health authority by telegram or telephone, any case of suspected food poisoning or an unusual prevalence of any illness in which fever, diarrhea, sore throat, vomiting, or jaundice is a prominent symptom?(l)(2)

1910.144 – SAFETY COLOR CODE FOR MARKING PHYSICAL HAZARDS

(a) Color Identification.

Red. (a)(1)

Is the color red used for identifying the following items: (a)(1)

Danger. (a)(1)(ii)

Are safety cans or other portable containers of flammable liquids having a flashpoint at or below 80°F., and table containers of flammable liquids painted red with some additional clearly visible identification, either in the form of a yellow band around the can or the name of the contents conspicuously stenciled or painted on the can in yellow? (a)(1)(ii)

Are red lights provided at barricades and at temporary obstructions, as specified in ANSI A10.2-1944? (a)(1)(ii)

Are all danger signs painted red? (a)(1)(ii)

Stop. (a)(1)(iii)

Are all emergency stop bars on hazardous machines such as rubber mills, wire blocks, flat work ironers, etc., painted red? (a)(1)(iii)

Are stop buttons or electrical switches used for emergency stopping of machinery painted red? (a)(1)(iii)

1910.144 – SAFETY COLOR CODE FOR MARKING PHYSICAL HAZARDS

(a) Color Identification.

YES NO

Yellow. (a)(3)

Is yellow used for designating caution and for marking physical hazards, such as a striking against, stumbling, falling, tripping, and "caught in between"? (a)(3)

1910.145 - SPECIFICATIONS FOR ACCIDENT PREVENTION SIGNS AND TAGS

(a) Scope (a)

These specifications apply to the design, application, and use of signs or symbols (as included in paragraphs (c) through (e) of this section) intended to indicate and, as far as possible, to define specific hazards of a nature such that failure to designate them may lead to accidental injury to workers or the public, or both, or to property damage. These specifications are intended to cover all safety signs except railroad signs, those designed for streets, highways, and marine regulations. (a)(1)

These specifications do not apply to plant bulletin boards or to safety posters. (a)(1)

Are all new signs and replacements of old signs on or after August 31, 1971, in accordance with these specifications? (a)(2)

(c) Classification of Signs According to Use (c)

Danger Signs (c)(1)

Are danger signs used only where an immediate hazard exists? (c)(1)(i)

Is there no variation in the type of design of signs posted to warn of specific dangers and radiation hazards? (c)(1)(i)

Are all employees instructed that danger signs indicate immediate danger and that special precautions are necessary? (c)(1)(ii)

Caution Signs (c)(2)

Are caution signs used only to warn against potential hazards or to caution against unsafe practices? (c)(2)(i)

Are employees instructed that caution signs indicate a possible hazard against which proper precaution should be taken? (c)(2)(ii)

Safety Instruction Signs (c)(3)

Are safety instruction signs used when there is a need for general instructions and suggestions relative to safety measures? (c)(3)

(d) Sign Design (d)

Design Features (d)(1)

Are the signs furnished with rounded or blunt corners, and are they free from sharp edges, burrs, splinters, or other sharp projections? (d)(1)

Are the ends or heads of bolts or other fastening devices located in such a way that they do not constitute a hazard? (d)(1)

1910.145 – SPECIFICATIONS FOR ACCIDENT PREVENTION SIGNS AND TAGS

(d) Sign Design.

YES NO

Danger Signs (d)(2)

Are the colors red, black, and white those of opaque glossy samples as specified in Table 1 of Fundamental Specification of Safety Colors for CIE Standard Source "C," American National Standard Z53.1-1967? (d)(2)(i)

Caution Signs (d)(4)

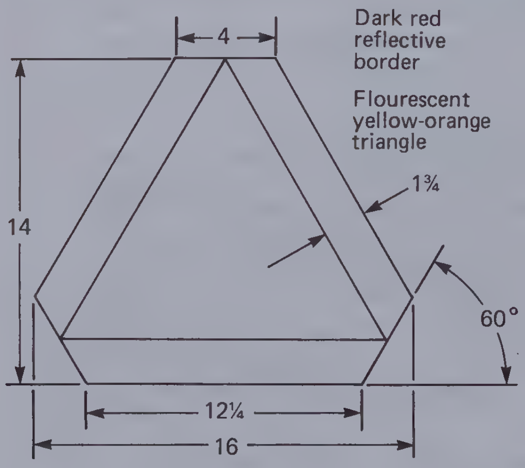
Is the standard color of the background yellow and the panel black with yellow letters? Are any letters used against the yellow background black? Are the colors those of opaque glossy samples specified in Table 1 of American National Standard Z53.1-1967? (d)(4)(i)

Safety Instruction Signs (d)(6)

Is the standard color of the background white and the panel green with white letters? Are any letters used against the white background black? Are the colors those of opaque glossy samples specified in Table 1 of American National Standard Z53.1-1967? (d)(6)(i)

Slow-Moving Vehicle Emblem (d)(10)

This emblem (see Figure J-7) consists of a fluorescent yellow-orange triangle with a dark red reflective border. The yellow-orange fluorescent triangle is a highly visible color for daylight exposure. The reflective border defines the shape of the fluorescent color in daylight and creates a hollow red triangle in the path of motor vehicle headlights at night. (d)(10)


4
Dark red reflective border
Flourescent yellow-orange triangle
1¾
14
60°
12¼
16

NOTE: All dimensions are in inches.

Figure J-7
Slow-Moving Vehicle Emblem

The emblem is intended as a unique identification for, and must be used only on, vehicles which by design move slowly (25 m.p.h. or less) on the public roads. (d)(10)

The emblem is not a clearance marker for wide machinery nor is it intended to replace required lighting or marking of slow-moving vehicles. Neither the color film pattern and its dimensions nor the backing must be altered to permit use of advertising or other markings. The material, location, mounting, etc. of the emblem must be in accordance with the American Society of Agricultural Engineers Emblem for Identifying Slow-Moving Vehicles, ASAE R276, 1967, or ASAE S276.2 (ANSI B114.1-1971). (d)(10)

(e) Sign Wordings (e)

Nature of Wording (e)(2)

Is the wording of each sign easy to read and concise? (e)(2)

Does each sign contain sufficient information to be easily understood? (e)(2)

Does the wording make a positive rather than negative suggestion and is it accurate in fact? (e)(2)

Biological Hazard Signs (e)(3)

Is the biological hazard warning used to signify the actual or potential presence of a biohazard and to identify equipment, containers, rooms, materials, experimental animals, or combinations thereof, which contain, or are contaminated with, viable hazardous agents? (For the purpose of this subparagraph, the term "biological hazard," or "biohazard," includes only those infectious agents presenting a risk or potential risk to the well-being of man.) (e)(3)

(f) Accident Prevention Tags (f)

This paragraph applies to all accident prevention tags used to identify hazardous conditions and provide a message to employees with respect to hazardous conditions as set forth in (f)(3) below, or to meet the specific tagging requirements of other OSHA standards. This section does not apply to construction, maritime, or agriculture. (f)(1)

Are tags used as a means to prevent accidental injury or illness to employees exposed to hazardous or potentially hazardous conditions, equipment, or operations which are out of the ordinary, unexpected, or not readily apparent? (f)(3)

Are tags used until the identified hazard is eliminated or the hazardous operation is completed? (f)(3)

Tags need not be used where signs, guarding, or other positive means of protection are being used. (f)(3)

Do all tags meet the following criteria:

- tags contain a signal word and a major message (f)(4)(i)
- the signal word is either "Danger," "Caution," or "Biological Hazard," "Biohazard," or the biological hazard symbol (f)(4)(i)(A)
- the major message indicates the specific hazardous condition or the instruction to be communicated to the employee (f)(4)(i)(B)
- the signal word is readable from a minimum distance of five feet or such greater distance as warranted by the hazard (f)(4)(ii)
- the major message is presented in pictographs, written text, or both (f)(4)(iii)
- the signal word and major message are understandable to all employees who may be exposed to the identified hazard (f)(4)(iv)
- all employees are informed of the meaning of various tags used in the workplace and what special precautions are necessary (f)(4)(v)

- tags are affixed as close as safely possible to their respective hazards by a positive means such as string, wire, or adhesive that prevents their loss or unintentional removal. (f)(4)(vi)

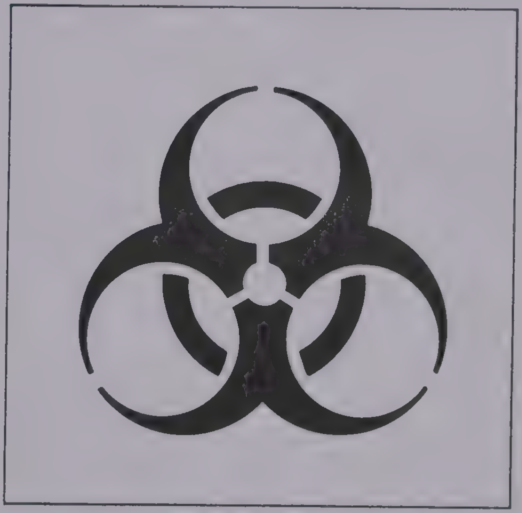
Danger tags are used only in major hazard situations where an immediate hazard presents a threat of death or serious injury to employees. (f)(5)

Caution tags are used only in minor hazard situations where a non-immediate or potential hazard or unsafe practice presents a lesser threat of employee injury. (f)(6)

Warning tags can be used to represent a hazard level between "Caution" and "Danger," instead of the required "Caution" tag, provided that they have a signal word of "Warning," an appropriate major message, and otherwise meet the general tag criteria of paragraph (f)(4). (f)(7)

Biological hazard tags are used to identify the actual or potential presence of a biological hazard and to identify equipment, containers, rooms, experimental animals, or combinations thereof, that contain or are contaminated with hazardous biological agents. (f)(8)(i)

The symbol design for biological hazard tags shall conform to the design shown below: (f)(8)(ii)



Biological Hazard Symbol Configuration

Biological Hazard Symbol Configuration

Other tags in addition to those required by this paragraph, or in other situations where this paragraph does not require tags, may be used provided they do not detract from the impact or visibility of the signal word and major message of any required tag. (f)(9)

Appendix A to this section, Recommended Color Coding, can be found under the red Self-Inspection Appendix tab in the back of this volume, Subpart J.

Appendix A — Recommended Color Coding (1910.145)

While the standard does not specifically mandate colors to be used on accident prevention tags, the following color scheme is recommended by OSHA for meeting the requirements of this section:

DANGER — Red, or predominantly red, with lettering or symbols in a contrasting color.

CAUTION — Yellow, or predominantly yellow, with lettering or symbols in a contrasting color.

WARNING — Orange — Orange, or predominantly orange, with lettering or symbols in a contrasting color.

BIOLOGICAL HAZARD — Flourescent orange, or orange-red, or predominantly so, with lettering or symbols in a contrasting color.

(a) Scope

This section contains requirements for practices and procedures to protect employees in general industry from the hazards of entry into permit-required confined spaces. This section does not apply to agriculture, to construction, or to shipyard employment (Parts 1928, 1926, and 1915 of this chapter, respectively).

(b) Definitions

Acceptable entry conditions. The conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space entry can safely enter into and work within the space.

Attendant. An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all attendant's duties assigned in the employer's permit space program. Authorized entrant means an employee who is authorized by the employer to enter a permit space.

Blanking or blinding. The absolute closure of a pipe, line, or duct by the fastening of a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that is capable of withstanding the maximum pressure of the pipe, line, or duct with no leakage beyond the plate.

Confined space means a space that:

(1) Is large enough and so configured that an employee can bodily enter and perform assigned work; and

(2) Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and

(3) Is not designed for continuous employee occupancy.

Double block and bleed. The closure of a line, duct, or pipe by closing and locking or tagging two in-line valves and by opening and locking or tagging a drain or vent valve in the line between the two closed valves.

Emergency. Any occurrence (including any failure of hazard control or monitoring equipment) or event internal or external to the permit space that could endanger entrants.

Engulfment. The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.

Entry. The action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.

Entry permit. (Permit) means the written or printed document that is provided by the employer to allow and control entry into a permit space and that contains the information specified in paragraph (f) of this section.

Entry supervisor. The person (such as the employer, foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this section.

> **NOTE:** An entry supervisor also may serve as an attendant or as an authorized entrant, as long as that person is trained and equipped as required by this section for each role he or she fills. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

Hazardous atmosphere. An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to self-rescue (that is, escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

(1) Flammable gas, vapor, or mist in excess of 10 percent of its lower flammable limit (LFL);

(2) Airborne combustible dust at a concentration that meets or exceeds its LFL;

> **NOTE:** This concentration may be approximated as a condition in which the dust obscures vision at a distance of 5 feet (1.52 m) or less.

(3) Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent;

(4) Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in Subpart G, Occupational Health and Environmental Control, or in Subpart Z, Toxic and Hazardous Substances, of this Part and which could result in employee exposure in excess of its dose or permissible exposure limit;

> **NOTE:** An atmospheric concentration of any substance that is not capable of causing death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects is not covered by this provision.

(5) Any other atmospheric condition that is immediately dangerous to life or health.

> **NOTE:** For air contaminants for which OSHA has not determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets that comply with the Hazard Communication Standard, 1910.1200 of this Part, published information, and internal documents can provide guidance in establishing acceptable atmospheric conditions.

Hot work permit. The employer's written authorization to perform operations (for example, riveting, welding, cutting, burning, and heating) capable of providing a source of ignition.

Immediately dangerous to life or health (IDLH). Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

YES NO N/A

NOTE: Some materials — hydrogen fluoride gas and cadmium vapor, for example — may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possibly fatal collapse 12-72 hours after exposure. The victim "feels normal" from recovery from transient effects until collapse. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.

Inerting. The displacement of the atmosphere in a permit space by a noncombustible gas (such as nitrogen) to such an extent that the resulting atmosphere is noncombustible.

NOTE: This procedure produces an IDLH oxygen-deficient atmosphere.

Isolation. The process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

Line breaking. The intentional opening of a pipe, line, or duct that is or has been carrying flammable, corrosive, or toxic material, an inert gas, or any fluid at a volume, pressure, or temperature capable of causing injury.

Non-permit confined space. A confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.Oxygen deficient atmosphere means an atmosphere containing less than 19.5 percent oxygen by volume.

Oxygen enriched atmosphere. An atmosphere containing more than 23.5 percent oxygen by volume.

Permit-required confined space. (Permit space) means a confined space that has one or more of the following characteristics:

(1) Contains or has a potential to contain a hazardous atmosphere;

(2) Contains a material that has the potential for engulfing an entrant;

(3) Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or

(4) Contains any other recognized serious safety or health hazard.

Permit-required confined space program. (Permit space program) means the employer's overall program for controlling, and, where appropriate, for protecting employees from, permit space hazards and for regulating employee entry into permit spaces.

Permit system. The employer's written procedure for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

YES NO N/A

Prohibited condition. Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.Rescue service means the personnel designated to rescue employees from permit spaces.

Retrieval system. The equipment (including a retrieval line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit spaces.

Testing. The process by which the hazards that may confront entrants of a permit space are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

NOTE: Testing enables employers both to devise and implement adequate control measures for the protection of authorized entrants and to determine if acceptable entry conditions are present immediately prior to, and during, entry.

(c) General Requirements

Does the employer evaluate the workplace to determine if any spaces are permit-required confined spaces? **(c)(1)**

NOTE: Proper application of the decision flow chart in Appendix A would facilitate compliance with this requirement.

If the workplace contains permit spaces, does the employer inform exposed employees, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the permit spaces? **(c)(2)**

NOTE: A sign reading "**DANGER — PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER**" or using other similar language would satisfy the requirement for a sign.

If the employer decides that its employees will not enter permit spaces, does the employer take effective measures to prevent its employees from entering the permit spaces? **(c)(3)**

Does the employer comply with paragraphs (c)(1), (c)(2), (c)(6), and (c)(8) of this section? **(c)(3)**

If the employer decides that its employees will enter permit spaces, does the employer develop and implement a written permit space program that complies with this section? **(c)(4)**

Is the written program available for inspection by employees and their authorized representatives? **(c)(4)**

NOTE: An employer may use the alternate procedures specified in paragraph (c)(5)(ii) of this section for entering a permit space under the conditions set forth in paragraph (c)(5)(i) of this section. **(c)(5)**

Employer Exemptions

Is an employer whose employees enter a permit space exempt from complying with paragraphs (d) through (f) and (h) through (k) of this section, if: **(c)(5)(i)**

- The employer can demonstrate that the only hazard posed by the permit space is an actual or potential hazardous atmosphere; **(c)(5)(i)(A)**
- The employer can demonstrate that continuous forced air ventilation alone is sufficient to maintain that permit space safe for entry; **(c)(5)(i)(B)**

YES NO N/A

- The employer develops monitoring and inspection data that supports the demonstrations required by paragraphs (c)(5)(i)(A) and (c)(5)(i)(B) of this section; **(c)(5)(i)(C)**
- If an initial entry of the permit space is necessary to obtain the data required by paragraph (c)(5)(i)(C) of this section, the entry is performed in compliance with paragraphs (d) through (k) of this section; **(c)(5)(i)(D)**
- The determinations and supporting data required by paragraphs (c)(5)(i)(A), (c)(5)(i)(B), and (c)(5)(i)(C) of this section are documented by the employer and are made available to each employee who enters the permit space under the terms of paragraph (c)(5) of this section; **(c)(5)(i)(E)**

AND

- Entry into the permit space under the terms of paragraph (c)(5)(i) of this section is performed in accordance with the requirements of paragraph (c)(5)(ii) of this section? **(c)(5)(i)(F)**

  NOTE: See paragraph (c)(7) of this section for reclassification of a permit space after all hazards within the space have been eliminated.

Requirements For Entry Into Permit Spaces

The following questions apply to entry into permit spaces and must be answered "Yes" in order to meet the required conditions set forth in paragraph (c)(5)(i) of this section: **(c)(5)(ii)**

- Are any conditions making it unsafe to remove an entrance cover eliminated before the cover is removed? **(c)(5)(ii)(A)**
- When entrance covers are removed, is the opening promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space? **(c)(5)(ii)(B)**
- Before an employee enters the space, is the internal atmosphere tested, with a calibrated direct-reading instrument, for the following conditions in the order given: **(c)(5)(ii)(C)**

  Oxygen content, **(c)(5)(ii)(C)(1)**

  Flammable gases and vapors, **(c)(5)(ii)(C)(2)**

AND

  Potential toxic air contaminants? **(c)(5)(ii)(C)(3)**

- Is there no hazardous atmosphere within the space whenever any employee is inside the space? **(c)(5)(ii)(D)**
- Is continuous forced air ventilation: **(c)(5)(ii)(E)**

  Used to eliminate any hazardous atomosphere before an employee is permitted to enter a space; **(c)(5)(ii)(E)(1)**

  Directed to ventilate the immediate areas where an employee is or will be present within the space and shall continue until all employees have left the space; **(c)(5)(ii)(E)(2)**

YES NO N/A

  From a clean source that does not increase the hazards in the space? **(c)(5)(ii)(E)(3)**

- Is the atmosphere within the space periodically tested as necessary to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere? **(c)(5)(ii)(F)**
- If a hazardous atmosphere is detected during entry: **(c)(5)(ii)(G)**

  Does each employee leave the space immediately; **(c)(5)(ii)(G)(1)**

  Is the space evaluated to determine how the hazardous atmosphere developed; **(c)(5)(ii)(G)(2)**

AND

  Are measures implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place? **(c)(5)(ii)(G)(3)**

- Does the employer verify that the space is safe for entry and that the pre-entry measures required by paragraph (c)(5)(ii) of this section have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification? **(c)(5)(ii)(H)**
- Is the certification made before entry and made available to each employee entering the space?(c)(5)(ii)(H)

When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, does the employer reevaluate that space and, if necessary, reclassify it as a permit-required confined space? **(c)(6)**

Non-Permit Confined Spaces Reclassifications

Is a space classified by the employer as a permit-required confined space reclassified as a non-permit confined space under the following procedures: **(c)(7)**

- If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space; **(c)(7)(i)**
- If the permit space is reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated; **(c)(7)(i)**
- If it is necessary to enter the permit space to eliminate hazards, such entry shall be performed under paragraphs (d) through (k) of this section; **(c)(7)(ii)**

AND

- If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, and the permit space is reclassified as a non-permit confined space for as long as the hazards remain eliminated? **(c)(7)(ii)**

  NOTE: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards. Paragraph (c)(5) covers permit space entry where the employer can demonstrate that forced air ventilation alone will control all hazards in the space.

YES NO N/A

Does the employer document the basis for determining that all hazards in a permit space have been eliminated, through a certification that contains the date, the location of the space, and the signature of the person making the determination? (c)(7)(iii)

Is the certification made available to each employee entering the space? (c)(7)(iii)

If hazards arise within a permit space that has been declassified to a non-permit space under paragraph (c)(7) of this section, does each employee in the space exit the space? (c)(7)(iv)

Does the employer then reevaluate the space and determine whether it must be reclassified as a permit space, in accordance with other applicable provisions of this section? (c)(7)(iv)

Contractors

When an employer (host employer) arranges to have employees of another employer (contractor) perform work that involves permit space entry, does the host employer: (c)(8)

- Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with permit space program meeting the requirements of this section; (c)(8)(i)
- Apprise the contractor of the elements, including the hazards identified and the host employer's experience with the space, that make the space in question a permit space; (c)(8)(ii)
- Apprise the contractor of any precautions or procedures that the host employer has implemented for the protection of employees in or near permit spaces where contractor personnel will be working; (c)(8)(iii)
- Coordinate entry operations with the contractor, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by paragraph (d)(11) of this section; (c)(8)(iv)

AND

- Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations? (c)(8)(v)

In addition to complying with the permit space requirements that apply to all employers, does each contractor who is retained to perform permit space entry operations: (c)(9)

- Obtain any available information regarding permit space hazards and entry operations from the host employer; (c)(9)(i)
- Coordinate entry operations with the host employer, when both host employer personnel and contractor personnel will be working in or near permit spaces, as required by paragraph (d)(11) of this section; (c)(9)(ii)

AND

- Inform the host employer of the permit space program that the contractor will follow and of any hazards confronted or created in permit spaces, either through a debriefing or during the entry operation? (c)(9)(iii)

YES NO N/A

(d) Permit-Required Confined Space Program

Under the permit space program required by paragraph (c)(4) of this section, does the employer: (d)

- Implement the measures necessary to prevent unauthorized entry; (d)(1)
- Identify and evaluate the hazards of permit spaces before employees enter them; (d)(2)
- Develop and implement the means, procedures, and practices necessary for safe permit space entry operations, including, but not limited to, the following: (d)(3)

Specifying acceptable entry conditions; (d)(3)(i)

Isolating the permit space; (d)(3)(ii)

Purging, inerting, flushing, or ventilating the permit space as necessary to eliminate or control atmospheric hazards; (d)(3)(iii)

Providing pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards; (d)(3)(iv)

AND

Verifying that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry? (d)(3)(v)

Provision and Use of Equipment

Under the permit-required confined space program required by paragraph (c)(4) of this section, does the employer provide the equipment (specified in paragraphs (d)(4)(i) through (d)(4)(ix) of this section) at no cost to employees? (d)(4)

Does the employer maintain the equipment (specified in paragraphs (d)(4)(i) through (d)(4)(ix) of this section) properly? (d)(4)

Does the employer ensure that employees use the following equipment properly: (d)(4)

- Testing and monitoring equipment needed to comply with paragraph (d)(5) of this section; (d)(4)(i)
- Ventilating equipment needed to obtain acceptable entry conditions; (d)(4)(ii)
- Communications equipment necessary for compliance with paragraphs (h)(3) and (i)(5) of this section; (d)(4)(iii)
- Personal protective equipment insofar as feasible engineering and work practice controls do not adequately protect employees; (d)(4)(iv)
- Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency; (d)(4)(v)
- Barriers and shields as required by paragraph (d)(3)(iv) of this section; (d)(4)(vi)
- Equipment, such as ladders, needed for safe ingress and egress by authorized entrants; (d)(4)(vii)
- Rescue and emergency equipment needed to comply with paragraph (d)(9) of this section, except to the extent that the equipment is provided by rescue services; (d)(4)(viii)

YES NO N/A

AND

- Any other equipment necessary for safe entry into and rescue from permit spaces? **(d)(4)(ix)**

Testing and Evaluation of Permit Space Conditions

Does the employer evaluate permit space conditions by testing conditions in the permit space to determine if acceptable entry conditions exist before entry is authorized to begin? **(d)(5)(i)**

If isolation of the space is infeasible because the space is large or is part of a continuous system (such as a sewer), does the employer perform pre-entry testing to the extent feasible before entry is authorized? **(d)(5)(i)**

If entry is authorized, does the employer ensure that entry conditions are continuously monitored in the areas where authorized entrants are working? **(d)(5)(i)**

Does the employer test or monitor the permit space as necessary to determine if acceptable entry conditions are being maintained during the course of entry operations? **(d)(5)(ii)**

When testing for atmospheric hazards, does the employer first test for oxygen, then for combustible gases and vapors, and then for toxic gases and vapors? **(d)(5)(iii)**

> **NOTE:** Atmospheric testing conducted in accordance with Appendix B would be considered as satisfying the requirements of this paragraph. For permit space operations in sewers, atmospheric testing conducted in accordance with Appendix B, as supplemented by Appendix E, would be considered as satisfying the requirements of this paragraph.

Assignment of Attendants

Does the employer provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations? **(d)(6)**

> **NOTE:** Attendants may be assigned to monitor more than one permit space provided the duties described in paragraph (i) of this section can be effectively performed for each permit space that is monitored. Likewise, attendants may be stationed at any location outside the permit space to be monitored as long as the duties described in paragraph (i) of this section can be effectively performed for each permit space that is monitored.

If multiple spaces are to be monitored by a single attendant, are the means and procedures to enable the attendant to respond to an emergency affecting one or more of the permit spaces included in the permit program? **(d)(7)**

Are the means and procedures that enable the attendant to respond to an emergency without distraction from other responsibilities detailed in paragraph (i) of this section also included in the permit program? **(d)(7)**

Additional Employer Responsibilities

Does the employer:

- Designate the persons who are to have active roles (as, for example, authorized entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit space) in entry operations; **(d)(8)**

YES NO N/A

- Identify the duties of each such employee, and provide each such employee with the training required by paragraph (g) of this section; **(d)(8)**
- Develop and implement procedures for summoning rescue and emergency services, for rescuing entrants from permit spaces, for providing necessary emergency services to rescued employees, and for preventing unauthorized personnel from attempting a rescue; **(d)(9)**
- Develop and implement a system for the preparation, issuance, use, and cancellation of entry permits as required by this section; **(d)(10)**
- Develop and implement procedures to coordinate entry operations when employees of more than one employer are working simultaneously as authorized entrants in a permit space, so that employees of one employer do not endanger the employees of any other employer; **(d)(11)**
- Develop and implement procedures (such as closing off a permit space and canceling the permit) necessary for concluding the entry after entry operations have been completed; **(d)(12)**

AND

- Review entry operations when the employer has reason to believe that the measures taken under the permit space program may not protect employees and revise the program to correct deficiencies found to exist before subsequent entries are authorized? **(d)(13)**

> **NOTE:** Examples of circumstances requiring the review of the permit space program are: any unauthorized entry of a permit space, the detection of a permit space hazard not covered by the permit, the detection of a condition prohibited by the permit, the occurrence of an injury or near-miss during entry, a change in the use or configuration of a permit space, and employee complaints about the effectiveness of the program.

Does the employer review the permit space program, using the canceled permits retained under paragraph (e)(6) of this section within 1 year after each entry and revise the program as necessary, to ensure that employees participating in entry operations are protected from permit space hazards? **(d)(14)**

> **NOTE:** Employers may perform a single annual review covering all entries performed during a 12-month period. If no entry is performed during a 12-month period, no review is necessary. Appendix C presents examples of permit space programs that are considered to comply with the requirements of paragraph (d) of this section.

(e) Permit System

Before entry is authorized, does the employer document the completion of measures required by paragraph (d)(3) of this section by preparing an entry permit? **(e)(1)**

> **NOTE:** Appendix D presents examples of permits whose elements are considered to comply with the requirements of this section.

Before entry begins, does the entry supervisor identified on the permit sign the entry permit to authorize entry? **(e)(2)**

	YES	NO	N/A
Is the completed permit made available at the time of entry to all authorized entrants, by posting it at the entry portal or by any other equally effective means, so that the entrants can confirm that pre-entry preparations have been completed? (e)(3)			
Does the duration of the permit not exceed the time required to complete the assigned task or job identified on the permit in accordance with paragraph (f)(2) of this section? (e)(4)			
Does the entry supervisor terminate entry and cancel the entry permit when: (e)(5)			
● The entry operations covered by the entry permit have been completed; (e)(5)(i)			
OR ● A condition that is not allowed under the entry permit arises in or near the permit space? (e)(5)(ii)			
Does the employer retain each canceled entry permit for at least 1 year to facilitate the review of the permit-required confined space program required by paragraph (d)(14) of this section? (e)(6)			
Are any problems encountered during an entry operation noted on the pertinent permit so that appropriate revisions to the permit space program can be made? (e)(6)			
(f) Entry Permit Does the entry permit that documents compliance with this section and authorizes entry to a permit space identify: (f)			
● The permit space to be entered; (f)(1)			
● The purpose of the entry; (f)(2)			
● The date and the authorized duration of the entry permit; (f)(3)			
● The authorized entrants within the permit space, by name or by such other means (for example, through the use of rosters or tracking systems) as will enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space; (f)(4)			
NOTE: This requirement may be met by inserting a reference on the entry permit as to the means used, such as a roster or tracking system, to keep track of the authorized entrants within the permit space.			
● The personnel, by name, currently serving as attendants; (f)(5)			
● The individual, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry; (f)(6)			
● The hazards of the permit space to be entered; (f)(7)			
● The measures used to isolate the permit space and to eliminate or control permit space hazards before entry; (f)(8)			

	YES	NO	N/A
NOTE: Those measures can include the lockout or tagging of equipment and procedures for purging, inerting, ventilating, and flushing permit spaces.			
● The acceptable entry conditions; (f)(9)			
● The results of initial and periodic tests performed under paragraph (d)(5) of this section, accompanied by the names or initials of the testers and by an indication of when the tests were performed; (f)(10)			
● The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services; (f)(11)			
● The communication procedures used by authorized entrants and attendants to maintain contact during the entry; (f)(12)			
● Equipment, such as personal protective equipment, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with this section; (f)(13)			
● Any other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety; (f)(14)			
AND ● Any additional permits, such as for hot work, that have been issued to authorize work in the permit space? (f)(15)			
(g) Training Does the employer provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section? (g)(1)			
Is training provided to each affected employee: (g)(2)			
● Before the employee is first assigned duties under this section; (g)(2)(i)			
● Before there is a change in assigned duties; (g)(2)(ii)			
● Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained; (g)(2)(iii)			
AND ● Whenever the employer has reason to believe either that there are deviations from the permit space entry procedures required by paragraph (d)(3) of this section or that there are inadequacies in the employee's knowledge or use of these procedures? (g)(2)(iv)			
Does the training establish employee proficiency in the duties required by this section? (g)(3)			
Does the training introduce new or revised procedures, as necessary, for compliance with this section? (g)(3)			

YES NO N/A

Does the employer certify that the training required by paragraphs (g)(1) through (g)(3) of this section has been accomplished? **(g)(4)**

Does the certification contain each employee's name, the signatures or initials of the trainers, and the dates of training? **(g)(4)**

Is the certification available for inspection by employees and their authorized representatives? **(g)(4)**

(h) Duties of Authorized Entrants

Does the employer ensure that all authorized entrants: **(h)**

- Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure; **(h)(1)**
- Properly use equipment as required by paragraph (d)(4) of this section; **(h)(2)**
- Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space as required by paragraph (i)(6) of this section; **(h)(3)**

AND

- Alert the attendant whenever: **(h)(4)**

The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, **(h)(4)(i)**

OR

The entrant detects a prohibited condition; **(h)(4)(ii)**

AND

Does the employer ensure that all authorized entrants exit from the permit space as quickly as possible whenever: **(h)(5)**

- An order to evacuate is given by the attendant or the entry supervisor; **(h)(5)(i)**
- The entrant recognizes any warning sign or symptom of exposure to a dangerous situation; **(h)(5)(ii)**
- The entrant detects a prohibited condition; **(h)(5)(iii)**

OR

- An evacuation alarm is activated? **(h)(5)(iv)**

(i) Duties of Attendants

Does the employer ensure that each attendant: **(i)(1)**

- Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure; **(i)(1)**
- Is aware of possible behavioral effects of hazard exposure in authorized entrants; **(i)(2)**
- Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants under paragraph (f)(4) of this section accurately identifies who is in the permit space; **(i)(3)**
- Remains outside the permit space during entry operations until relieved by another attendant; **(i)(4)**

YES NO N/A

NOTE: When the employer's permit entry program allows attendant entry for rescue, attendants may enter a permit space to attempt a rescue if they have been trained and equipped for rescue operations as required by paragraph (k)(1) of this section and if they have been relieved as required by paragraph (i)(4) of this section.

Does the employer assure that each attendant:

- Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space under paragraph (i)(6) of this section; **(i)(5)**
- Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions: **(i)(6)**

If the attendant detects a prohibited condition; **(i)(6)(i)**

If the attendant detects the behavioral effects of hazard exposure in an authorized entrant; **(i)(6)(ii)**

If the attendant detects a situation outside the space that could endanger the authorized entrants; **(i)(6)(iii)**

OR

If the attendant cannot effectively and safely perform all the duties required under paragraph (i) of this section; **(i)(6)(iv)**

- Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards; **(i)(7)**
- Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway: **(i)(8)**

Warn the unauthorized persons that they must stay away from the permit space; **(i)(8)(i)**

Advise the unauthorized persons that they must exit immediately if they have entered the permit space; **(i)(8)(ii)**

AND

Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space; **(i)(8)(iii)**

- Performs non-entry rescues as specified by the employer's rescue procedure; **(i)(9)**

AND

- Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants? **(i)(10)**

(j) Duties of Entry Supervisors

Does the employer ensure that each entry supervisor:

- Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure; **(j)(1)**

YES NO N/A

- Verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin; (j)(2)
- Terminates the entry and cancels the permit as required by paragraph (e)(5) of this section; (j)(3)
- Verifies that rescue services are available and that the means for summoning them are operable; (j)(4)
- Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; (j)(5)

AND

- Determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained? (j)(6)

(k) Rescue and Emergency Services

Requirements for Employers Who Have Employees Enter Permit Spaces to Perform Rescue Services

Does the employer ensure that each member of the rescue service is provided with, and is trained to use properly, the personal protective equipment and rescue equipment necessary for making rescues from permit spaces? **(k)(1)(i)**

Is each member of the rescue service trained to perform the assigned rescue duties? **(k)(1)(ii)**

Does each member of the rescue service also receive the training required of authorized entrants under paragraph (g) of this section? **(k)(1)(ii)**

Does each member of the rescue service practice making permit space rescues at least once every 12 months, by means of simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or from representative permit spaces? **(k)(1)(iii)**

Do representative permit spaces, with respect to opening size, configuration, and accessibility, simulate the types of permit spaces from which rescue is to be performed? **(k)(1)(iii)**

YES NO N/A

Is each member of the rescue service trained in basic first-aid and in cardiopulmonary resuscitation (CPR)? **(k)(1)(iv)**

Is at least one member of the rescue service holding current certification in first aid and in CPR available? **(k)(1)(iv)**

When an employer (host employer) arranges to have persons other than the host employer's employees perform permit space rescue, does the host employer: **(k)(2)**

- Inform the rescue service of the hazards they may confront when called on to perform rescue at the host employer's facility; **(k)(2)(i)**

AND

- Provide the rescue service with access to all permit spaces from which rescue may be necessary so that the rescue service can develop appropriate rescue plans and practice rescue operations? **(k)(2)(ii)**

To facilitate non-entry rescue, are retrieval systems or methods used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant? **(k)(3)**

Requirements for Retrieval Systems

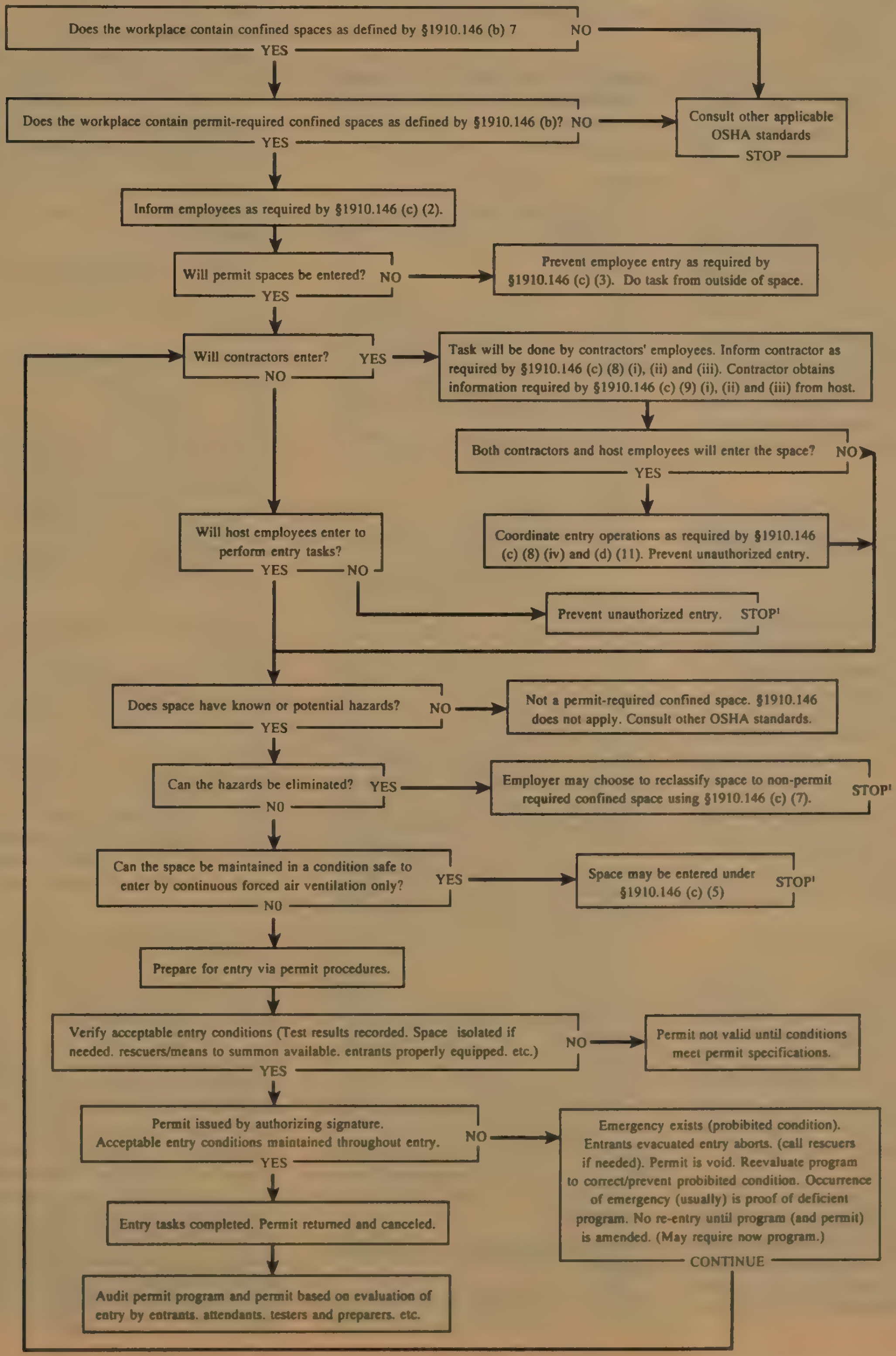
- Does each authorized entrant use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near shoulder level, or above the entrant's head? **(k)(3)(i)**
- Are wristlets used in lieu of the chest or full body harness if the employer can demonstrate that the use of a chest or full body harness is infeasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative? **(k)(3)(i)**
- Is a mechanical device or fixed point outside the permit space attached to other end of the retrieval line in such a manner that rescue can begin as soon as the rescuer becomes aware that recue is necessary? **(k)(3)(ii)**

If an injured entrant is exposed to a substance for which a Material Safety Data Sheet (MSDS) or other similar information is required to be kept at the worksite, is that MSDS or written information made available to the medical facility treating the exposed entrant? **(k)(4)**

APPENDIX A TO SECTION 1910.146 — CONFINED SPACE — NON MANDATORY

Note: *Appendices A through E serve to provide information and non-mandatory guidelines to assist employers and employees in complying with the appropriate requirements of this section.*

Appendix A to Section 1910.146 — Permit-required Confined Spaces Flow Chart


Does the workplace contain confined spaces as defined by §1910.146 (b) 7
NO
YES
Does the workplace contain permit-required confined spaces as defined by §1910.146 (b)?
NO
YES
Consult other applicable OSHA standards
STOP
Inform employees as required by §1910.146 (c) (2).
Will permit spaces be entered?
NO
YES
Prevent employee entry as required by §1910.146 (c) (3). Do task from outside of space.
Will contractors enter?
YES
NO
Task will be done by contractors' employees. Inform contractor as required by §1910.146 (c) (8) (i), (ii) and (iii). Contractor obtains information required by §1910.146 (c) (9) (i), (ii) and (iii) from host.
Both contractors and host employees will enter the space?
NO
YES
Coordinate entry operations as required by §1910.146 (c) (8) (iv) and (d) (11). Prevent unauthorized entry.
Will host employees enter to perform entry tasks?
YES
NO
Prevent unauthorized entry. STOP¹
Does space have known or potential hazards?
NO
YES
Not a permit-required confined space. §1910.146 does not apply. Consult other OSHA standards.
Can the hazards be eliminated?
YES
NO
Employer may choose to reclassify space to non-permit required confined space using §1910.146 (c) (7).
STOP¹
Can the space be maintained in a condition safe to enter by continuous forced air ventilation only?
YES
NO
Space may be entered under §1910.146 (c) (5)
STOP¹
Prepare for entry via permit procedures.
Verify acceptable entry conditions (Test results recorded. Space isolated if needed. rescuers/means to summon available. entrants properly equipped. etc.)
NO
YES
Permit not valid until conditions meet permit specifications.
Permit issued by authorizing signature. Acceptable entry conditions maintained throughout entry.
NO
YES
Emergency exists (probibited condition). Entrants evacuated entry aborts. (call rescuers if needed). Permit is void. Reevaluate program to correct/prevent probibited condition. Occurrence of emergency (usually) is proof of deficient program. No re-entry until program (and permit) is amended. (May require now program.)
CONTINUE
Entry tasks completed. Permit returned and canceled.
Audit permit program and permit based on evaluation of entry by entrants. attendants. testers and preparers. etc.

[1] Space may have to be evacuated and re-evaluated if hazards arise during entry

Appendix B to 1910.146 – Procedures for Atmospheric Testing

Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the permit space and verification that acceptable entry conditions for entry into that space exist.

(1) Evaluation testing. The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these data, and development of the entry procedure, should be done by, or reviewed by, a technically qualified professional (e.g., OSHA consultation service, or certified industrial hygienist, registered safety engineer, certified safety professional, certified marine chemist, etc.) based on evaluation of all serious hazards.

(2) Verification testing. The atmosphere of a permit space which may contain a hazardous atmosphere should be tested for residues of all contaminants identified by evaluation testing using permit specified equipment to determine that residual concentrations at the time of testing and entry are within the range of acceptable entry conditions. Results of testing (i.e., actual concentration, etc.) should be recorded on the permit in the space provided adjacent to the stipulated acceptable entry condition.

(3) Duration of testing. Measurement of values for each atmospheric parameter should be made for at least the minimum response time of the test instrument specified by the manufacturer.

(4) Testing stratified atmospheres. When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested a distance of approximately 4 feet (1.22 m) in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.

(5) Order of testing. A test for oxygen is performed first because most combustible gas meters are oxygen dependent and will not provide reliable readings in an oxygen deficient atmosphere. Combustible gases are tested for next because the threat of fire or explosion is both more immediate and more life threatening, in most cases, than exposure to toxic gases and vapors. If test for toxic gases and vapors are necessary, they are performed last.

Appendix C to 1910.146 – Examples of Permit-required Confined Space Programs

Example 1.

Workplace. Sewer entry.

Potential hazards. The employees could be exposed to the following:

Engulfment.

Presence of toxic gases. Equal to or more than 10 ppm hydrogen sulfide measured as an 8-hour time-weighted average. If the presence of other toxic contaminants is suspected, specific monitoring programs will be developed.

Presence of explosive/flammable gases. Equal to or greater than 10% of the lower flammable limit (LFL).

Oxygen Deficiency. A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume.

A. ENTRY WITHOUT PERMIT/ATTENDANT Certification. Confined spaces may be entered without the need for a written permit or attendant provided that the space can be maintained in a safe condition for entry by mechanical ventilation alone as provided in §1910.146(c)(5). All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. Any employee required or permitted to precheck or enter an enclosed/confined space shall have successfully completed, as a minimum, the training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job. The Confined Space Pre-Entry Check List must be completed by the* LEAD WORKER *before entry into a confined space. This list verifies completion of items listed below. This check list shall be kept at the job site for duration of the job. If circumstances dictate an* interruption in the work, the permit space *must be re-evaluated and a new check list must be completed.*

Control of atmospheric and engulfment hazards.

Pumps and Lines. All pumps and lines which may reasonably cause contaminants to flow into the space shall be disconnected, blinded and locked out, or effectively isolated by other means to prevent development of dangerous air contamination or engulfment. Not all laterals to sewers or storm drains require blocking. However, where experience or knowledge of industrial use indicates there is a reasonable potential for contamination of air or engulfment into an occupied sewer, then all affected laterals shall be blocked. If blocking and/or isolation requires entry into the space the provisions for entry into a permit-required confined space must be implemented.

Surveillance. The surrounding area shall be surveyed to avoid hazards such as drifting vapors from the tanks, piping, or sewers.

Testing. The atmosphere within the space will be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. Detector tubes, alarm only gas monitors and explosion meters are examples of monitoring equipment that may be used to test permit space atmospheres. Testing shall be performed by the LEAD WORKER who has successfully completed the Gas Detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL, and hydrogen sulfide concentration. A written record of the pre-entry test results shall be made and kept at the work site for the duration of the job. The supervisor will certify in writing, based upon the results of the pre-entry testing, that all hazards have been eliminated. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in two adjoining, connecting spaces.

Entry Procedures. If there are no non-atmospheric hazards present and if the pre-entry tests show there is no dangerous air contamination and/or oxygen deficiency within the space and there is no reason to believe that any is likely to develop, entry into and work within may proceed. Continuous testing of the atmosphere in the immediate vicinity of the workers within the space shall be accomplished. The workers will immediately leave the permit space when any of the gas monitor alarm set points are reached as defined. Workers will not return to the area until a SUPERVISOR who has completed the gas detector training has used a direct reading gas detector to evaluate the situation and has determined that it is safe to enter.

Rescue. Arrangements for rescue services are not required where there is no attendant. See the rescue portion of section B., below, for instructions regarding rescue planning where an entry permit is required.

B. *ENTRY PERMIT REQUIRED*

Permits. Confined Space Entry Permit. All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. Any employee required or permitted to pre-check or enter a permit-required confined space shall have successfully completed, as a minimum, the training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job.* The Confined Space Entry Permit must be completed before approval can be given to enter a permit-required confined space. This permit verifies completion of items listed below. This permit shall be kept at the job site for the duration of the job. If circumstances cause an interruption in the work or a change in the alarm conditions for which entry was approved, a new Confined Space Entry Permit must be completed.

Control of atmospheric and engulfment hazards.

Surveillance. The surrounding area shall be surveyed to avoid hazards such as drifting vapors from tanks, piping or sewers.

Testing. The confined space atmosphere shall be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. A direct reading gas monitor shall be used.

Testing shall be performed by the SUPERVISOR who has successfully completed the gas detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL and hydrogen sulfide concentration. A written record of the pre- entry test results shall be made and kept at the work site for the duration of the job. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in two adjoining, connected spaces.

Space Ventilation. Mechanical ventilation systems, where applicable, shall be set at 100% outside air. Where possible, open additional manholes to increase air circulation. Use portable blowers to augment natural circulation if needed. After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that the hazardous atmosphere has been eliminated.

Entry Procedures. The following procedure shall be observed under any of the following conditions: 1.) Testing demonstrates the existence of dangerous or deficient conditions and additional ventilation cannot reduce concentrations to safe levels; 2.) The atmosphere tests as safe but unsafe conditions can reasonably be expected to develop; 3.) It is not feasible to provide for ready exit from spaces equipped with automatic fire suppression systems and it is not practical or safe to deactivate such systems; or 4.) An emergency exists and it is not feasible to wait for pre-entry procedures to take effect.

All personnel must be trained. A self contained breathing apparatus shall be worn by any person entering the space. At least one worker shall stand by the outside of the space ready to give assistance in case of emergency. The standby worker shall have a self contained breathing apparatus available for immediate use. There shall be at least one additional worker within sight or call of the standby worker. Continuous powered communications shall be maintained between the worker within the confined space and standby personnel.

If at any time there is any questionable action or non-movement by the worker inside, a verbal check will be made. If there is no response, the worker will be moved immediately. *Exception:* If the worker is disabled due to falling or impact, he/she shall not be removed from the confined space unless there is immediate danger to his/her life. Local fire department rescue personnel shall be notified immediately. The standby worker may only enter the confined space in case of an emergency (wearing the self contained breathing apparatus) and only after being relieved by another worker. Safety belt or harness with attached lifeline shall be used by all workers entering the space with the free end of the line secured outside the entry opening. The standby worker shall attempt to remove a disabled worker via his lifeline before entering the space.

When practical, these spaces shall be entered through side openings — those within 3½ feet (1.07 m) of the bottom. When entry must be through a top opening, the safety belt shall be of the harness type that suspends a person upright and a hoisting device or similar apparatus shall be available for lifting workers out of the space.In any situation where their use may endanger the worker, use of a hoisting device or safety belt and attached lifeline may be discontinued.

When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment shall be Class 1, Division 1 rated per National Electrical Code and no ignition sources shall be introduced into the area.

Continuous gas monitoring shall be performed during all confined space operations. If alarm conditions change adversely, entry personnel shall exit the confined space and a new confined space permit issued.

Rescue. Call the fire department services for rescue. Where immediate hazards to injured personnel are present, workers at the site shall implement emergency procedures to fit the situation.

Example 2.

Workplace. Meat and poultry rendering plants.

Cookers and dryers are either batch or continuous in their operation. Multiple batch cookers are operated in parallel. When one unit of a multiple set is shut down for repairs, means are available to isolate that unit from the others which remain in operation.

Cookers and dryers are horizontal, cylindrical vessels equipped with a center, rotating shaft and agitator paddles or discs. If the inner shell is jacketed, it is usually heated with steam at pressures up to 150 psig (1034.25 kPa). The rotating shaft assembly of the continuous cooker or dryer is also steam heated.

Potential Hazards. The recognized hazards associated with cookers and dryers are the risk that employees could be:

1. Struck or caught by rotating agitator;

2. Engulfed in raw material or hot, recycled fat;

3. Burned by steam from leaks into the cooker/dryer steam jacket or the condenser duct system if steam valves are not properly closed and locked out;

4. Burned by contact with hot metal surfaces, such as the agitator shaft assembly, or inner shell of the cooker/dryer;

5. Heat stress caused by warm atmosphere inside cooker/dryer;

6. Slipping and falling on grease in the cooker/dryer;

7. Electrically shocked by faulty equipment taken into the cooker/dryer;

8. Burned or overcome by fire or products of combustion; or

9. Overcome by fumes generated by welding or cutting done on grease covered surfaces.

Permits. The supervisor in this case is always present at the cooker/dryer or other permit entry confined space when entry is made. The supervisor must follow the pre-entry isolation procedures described in the entry permit in preparing for entry, and ensure that the protective clothing, ventilating equipment and any other equipment required by the permit are at the entry site.

Control of hazards. Mechanical. Lock out main power switch to agitator motor at main power panel. Affix tag to the lock to inform others that a permit entry confined space entry is in progress.

Engulfment. Close all valves in the raw material blow line. Secure each valve in its closed position using chain and lock. Attach a tag to the valve and chain warning that a permit entry confined space entry is in progress. The same procedure shall be used for securing the fat recycle valve.

Burns and heat stress. Close steam supply valves to jacket and secure with chains and tags. Insert solid blank at flange in cooker vent line to condenser manifold duct system. Vent cooker/dryer by opening access door at discharge end and top center door to allow natural ventilation throughout the entry. If faster cooling is needed, use an portable ventilation fan to increase ventilation. Cooling water may be circulated through the jacket to reduce both outer and inner surface temperatures of cooker/dryers faster. Check air and inner surface temperatures in cooker/dryer to assure they are within acceptable limits before entering, or use proper protective clothing.

Fire and fume hazards. Careful site preparation, such as cleaning the area within 4 inches (10.16 cm) of all welding or torch cutting operations, and proper ventilation are the preferred controls. All welding and cutting operations shall be done in accordance with the requirements of 29 CFR Part 1910, Subpart Q, OSHA's welding standard. Proper ventilation may be achieved by local exhaust ventilation, or the use of portable ventilation fans, or a combination of the two practices.

Electrical shock. Electrical equipment used in cooker/dryers shall be in serviceable condition.

Slips and falls. Remove residual grease before entering cooker/dryer.

Attendant. The supervisor shall be the attendant for employees entering cooker/dryers.

Permit. The permit shall specify how isolation shall be done and any other preparations needed before making entry. This is especially important in parallel arrangements of cooker/dryers so that the entire operation need not be shut down to allow safe entry into one unit.

Rescue. When necessary, the attendant shall call the fire department as previously arranged.

Example 3.

Workplace. Workplaces where tank cars, trucks, and trailers, dry bulk tanks and trailers, railroad tank cars, and similar portable tanks are fabricated or serviced.

A. During fabrication. These tanks and dry-bulk carriers are entered repeatedly throughout the fabrication process. These products are not configured identically, but the manufacturing processes by which they are made are very similar.

Sources of hazards. In addition to the mechanical hazards arising from the risks that an entrant would be injured due to contact with components of the tank or the tools being used, there is also the risk that a worker could be injured by breathing fumes from welding materials or mists or vapors from materials used to coat the tank interior. In addition, many of these vapors and mists are flammable, so the failure to properly ventilate a tank could lead to a fire or explosion.

Control of hazards.

Welding. Local exhaust ventilation shall be used to remove welding fumes once the tank or carrier is completed to the point that workers may enter and exit only through a manhole. (Follow the requirements of 29 CFR 1910, Subpart Q, OSHA's welding standard, at all times.) Welding gas tanks may never be brought into a tank or carrier that is a permit entry confined space.

Application of interior coatings/linings. Atmospheric hazards shall be controlled by forced air ventilation sufficient to keep the atmospheric concentration of flammable materials below 10% of the lower flammable limit (LFL), or lower explosive limit (LEL), whichever term is used locally). The appropriate respirators are provided and shall be used in addition to providing forced ventilation if the forced ventilation does not maintain acceptable respiratory conditions.

Permits. Because of the repetitive nature of the entries in these operations, an "Area Entry Permit" will be issued for a 1 month period to cover those production areas where tanks are fabricated to the point that entry and exit are made using manholes.

Authorization. Only the area supervisor may authorize an employee to enter a tank within the permit area. The area supervisor must determine that conditions in the tank trailer, dry bulk trailer or truck, etc. meet permit requirements before authorizing entry.

Attendant. The area supervisor shall designate an employee to maintain communication by employer specified means with employees working in tanks to ensure their safety. The attendant may not enter any permit entry confined space to rescue an entrant or for any other reason, unless authorized by the rescue procedure and, and even then, only after calling the rescue team and being relieved by as attendant by another worker.

Communications and observation. Communications between attendant and entrant(s) shall be maintained throughout entry. Methods of communication that may be specified by the permit include voice, voice powered radio, tapping or rapping codes on tank walls, signalling tugs on a rope, and the attendant's observation that work activities such as chipping, grinding, welding, spraying, etc., which require deliberate operator control continue normally. These activities often generate so much noise that the necessary hearing protection makes communication by voice difficult.

Rescue procedures. Acceptable rescue procedures include entry by a team of employee-rescuers, use of public emergency services, and procedures for breaching the tank. The area permit specifies which procedures are available, but the area supervisor makes the final decision based on circumstances. (Certain injuries may make it necessary to breach the tank to remove a person rather than risk additional injury by removal through an existing manhole. However, the supervisor must ensure that no breaching procedure used for rescue would violate terms of the entry permit. For instance, if the tank must be breached by cutting with a torch, the tank surfaces to be cut must be free of volatile or combustible coatings within

4 inches (10.16 cm) of the cutting line and the atmosphere within the tank must be below the LFL.

Retrieval line and harnesses. The retrieval lines and harnesses generally required under this standard are usually impractical for use in tanks because the internal configuration of the tanks and their interior baffles and other structures would prevent rescuers from hauling out injured entrants. However, unless the rescue procedure calls for breaching the tank for rescue, the rescue team shall be trained in the use of retrieval lines and harnesses for removing injured employees through manholes.

B. *Repair or service of "used" tanks and bulk trailers.*

Sources of hazards. In addition to facing the potential hazards encountered in fabrication or manufacturing, tanks or trailers which have been in service may contain residues of dangerous materials, whether left over from the transportation of hazardous cargoes or generated by chemical or bacterial action on residues of non-hazardous cargoes.

Control of atmospheric hazards. A "used" tank shall be brought into areas where tank entry is authorized only after the tank has been emptied, cleansed (without employee entry) of any residues, and purged of any potential atmospheric hazards.

Welding. In addition to tank cleaning for control of atmospheric hazards, coating and surface materials shall be removed 4 inches (10.16 cm) or more from any surface area where welding or other torch work will be done and care taken that the atmosphere within the tank remains well below the LFL. (Follow the requirements of 29 CFR 1910, Subpart Q, OSHA's welding standard, at all times.)

Permits. An entry permit valid for up to 1 year shall be issued prior to authorization of entry into used tank trailers, dry bulk trailers or trucks. In addition to the pre-entry cleaning requirement, this permit shall require the employee safeguards specified for new tank fabrication or construction permit areas.

Authorization. Only the area supervisor may authorize an employee to enter a tank trailer, dry bulk trailer or truck within the permit area. The area supervisor must determine that the entry permit requirements have been met before authorizing entry.

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APPENDIX D – 1

Confined Space Entry Permit

Date and Time Issued: ____________________

Job site/Space I.D.: ____________________

Equipment to be worked on: ____________________

Date and Time Expires: ____________________

Job Supervisor ____________________

Work to be performed: ____________________

Stand-by personnel ____________________ ____________________ ____________________

1. Atmospheric Checks:

Time	______	
Oxygen	______	%
Explosive	______	% L.F.L.
Toxic	______	PPM

2. Tester's signature ____________________

3. Source isolation (No Entry):	N/A	Yes	No
Pumps or lines blinded,	( )	( )	( )
disconnected, or blocked	( )	( )	( )

4. Ventilation Modification:	N/A	Yes	No
Mechanical	( )	( )	( )
Natural Ventilation only	( )	( )	( )

5. Atmospheric check after Isolation and Ventilation:

Oxygen ______	%	>	19.5	%
Explosive ______	% L.F.L.	<	10	%
Toxic ______	PPM	<	10	PPM H_2S
Time ______				

6. Communication procedures: ____________________
____

7. Rescue procedures: ____________________
____
____

8. Entry, standby, and back up persons:	Yes	No
Successfully completed required training?		
Is it current?	( )	( )

9. Equipment:	N/A	Yes	No
Direct reading gas monitor – tested	( )	( )	( )
Safety harnesses and lifelines for entry and standby persons	( )	( )	( )
Hoisting equipment	( )	( )	( )
Powered communications	( )	( )	( )
SCBA's for entry and standby persons	( )	( )	( )
Protective Clothing	( )	( )	( )
All electric equipment listed Class I, Division I, Group D and Non-sparking tools	( )	( )	( )

10. Periodic atmospheric tests:

Oxygen	____%	Time ____	Oxygen	____%	Time ____
Oxygen	____%	Time ____	Oxygen	____%	Time ____
Explosive	____%	Time ____	Explosive	____%	Time ____
Explosive	____%	Time ____	Explosive	____%	Time ____
Toxic	____%	Time ____	Toxic	____%	Time ____
Toxic	____%	Time ____	Toxic	____%	Time ____

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit Prepared By: (Supervisor) ____________________ ____________________

Approved By: (Unit Supervisor) ____________________ ____________________

Reviewed By (Cs Operations Personnel): ____________________ ____________________

(printed name) signature)

This permit to be kept at job site. Return job site copy to Safety Office following job completion.
Copies: White Original (Safety Office) Yellow (Unit Supervisor) Hard (Job site)

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APPENDIX D – 2

ENTRY PERMIT

PERMIT VALID FOR 8 HOURS ONLY. ALL COPIES OF PERMIT WILL REMAIN AT JOB SITE UNTIL JOB IS COMPLETED

DATE: ______ SITE LOCATION/DESCRIPTION ______

PURPOSE OF ENTRY ______

SUPERVISOR(S) in charge of crews Type of Crew Phone #

______

______

COMMUNICATION PROCEDURES ______

RESCUE PROCEDURES (PHONE NUMBERS AT BOTTOM) ______

* BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY*

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Lock Out/De-energize/Try-out			Full Body Harness w/"D" ring		
Line(s) Broken-Capped-Blanked			Emergency Escape Retrieval Equip		
Purge-Flush and Vent			Lifelines		
Ventilation			Fire Extinguishers		
Secure Area (Post and Flag)			Lighting (Explosive Proof)		
Breathing Apparatus			Protective Clothing		
Resuscitator – Inhalator			Respirator(s) (Air Purifying)		
Standby Safety Personnel			Burning and Welding Permit		

Note: Items that do not apply enter N/A in the blank.

**RECORD CONTINUOUS MONITORING RESULTS EVERY 2 HOURS

CONTINUOUS MONITORING** TEST(S) TO BE TAKEN	Permissible Entry Level									
PERCENT OF OXYGEN	19.5% to 23.5%									
LOWER FLAMMABLE LIMIT	Under 10%									
CARBON MONOXIDE	+35 PPM									
Aromatic Hydrocarbon	+ 1 PPM	* 5PPM								
Hydrogen Cyanide	(Skin)	* 4PPM								
Hydrogen Sulfide	+10 PPM	*15PPM								
Sulfur Dioxide	+ 2 PPM	* 5PPM								
Ammonia		*35PPM								

*Short-term exposure limit:Employee can work in the area up to 15 minutes.

+8 hr. Time Weighted Avg.:Employee can work in area 8 hrs (longer with appropriate respiratory protection).

REMARKS: ______

GAS TESTER NAME & CHECK #	INSTRUMENT(S) USED	MODEL &/OR TYPE	SERIAL &/OR UNIT #

SAFETY STANDBY PERSON IS REQUIRED FOR ALL CONFINED SPACE WORK

SAFETY STANDBY PERSON(S)	CHECK #	CONFINED SPACE ENTRANT(S)	CHECK #	CONFINED SPACE ENTRANT(S)	CHECK #

SUPERVISOR AUTHORIZING – ALL CONDITIONS SATISFIED ______ DEPARTMENT/PHONE ______

AMBULANCE 2800 FIRE 2900 Safety 4910 Gas Coordinator 4529/5387

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SAN DIEGO, CA 92108 OCT 21

Appendix E to 1910.146 — Sewer System Entry.

Sewer entry differs in three vital respects from other permit entries; first, there rarely exists any way to completely isolate the space (a section of a continuous system) to be entered; second, because isolation is not complete, the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant or employer, and third, experienced sewer workers are especially knowledgeable in entry and work in their permit spaces because of their frequent entries. Unlike other employments where permit space entry is a rare and exceptional event, sewer workers' usual work environment is a permit space.

(1) *Adherence to procedure.* The employer should designate as entrants only employees who are thoroughly trained in the employer's sewer entry procedures and who demonstrate that they follow these entry procedures exactly as prescribed when performing sewer entries.

(2) *Atmospheric monitoring.* Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment which sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions is encountered: Oxygen concentration less than 19.5 percent; flammable gas or vapor at 10 percent or more of the lower flammable limit (LFL); or hydrogen sulfide or carbon monoxide at or above 10 ppm or 50 ppm, respectively measured as an 8-hour time-weighted average.

Atmospheric monitoring equipment needs to be calibrated according to the manufactures' instructions.

Substance specific devices should be used whenever actual or potential contaminants have been identified. The instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrants' direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

(3) *Surge flow and flooding.* Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.

(4) *Special Equipment.* Entry into large bore sewers may require the use of special equipment. Such equipment might include such items as atmosphere monitoring devices with automatic audible alarms, escape self-contained breathing apparatus (ESCBA) with at least 10 minute air supply (or other NIOSH approved self-rescuer), and waterproof flashlights, and may also include boats and rafts, radios and rope stand-offs for pulling around bends and corners as needed.

This standard covers the servicing and maintenance of machines and equipment where the unexpected energization, start-up, or release of energy could cause injury to employees. The standard establishes minimum performance requirements for the control of such hazardous energy, and applies to the control of energy during normal servicing and/or maintenance of machines and equipment. Normal production operations are covered in Subpart O. **(a)(1)(i)**

This standard does not apply to construction, agriculture, and maritime employment; installations under the exclusive control of electrical utilities; exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installation (see Subpart S); and oil and gas well drilling and servicing. **(a)(1)(ii)(A-D)**

Application

This standard applies to the control of energy during servicing and/or normal maintenance of machines and equipment if: **(a)(2)(i)**

- An employee is required to remove or bypass a guard or other safety device; **(a)(2)(ii)(A)**

OR

- An employee is required to place any part of his or her body into an area on a machine or piece of equipment where work is being performed upon the point of operation, or when an associated danger zone exists during a machine operating cycle. **(a)(2)(ii)(B)**

EXCEPTION: Minor tool changes and adjustments which take place during normal production operations are not covered by this standard if they are routine, repetitive, and integral to the use of the equipment for production, provided that the work is performed using alternative measures which provide effective protection. (See Subpart O).

NOTE: This standard does not apply to work on cord-and-plug connected electrical equipment when the employee performing the service or maintenance controls energization by unplugging the equipment from the energy source. The standard also does not apply to hot tap operations involving transmission systems from substances such as gas, steam, water, or petroleum. when they are performed on pressurized pipelines. However, it must be demonstrated that the continuity of service is essential, shut off of the system is impractical, documented procedures are followed, and special equipment is used which provides effective protection. **(a)(2)(iii)(A-B)(1-3)**

Purpose

Has a program been established which outlines procedures for fastening appropriate lockout or tagout devices to energy isolating devices? **(a)(3)(i)**

Do the procedures in this program prevent the unexpected energization of machines or equipment or the release of stored energy, which could cause injury to employees? **(a)(3)(i)**

When other standards in this Manual require the use of lockout or tagout devices, are they supplemented by procedural and training requirements of this section? **(a)(3)(ii)**

(b) Definitions

Affected employee. An employee whose job requires him or her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout; or whose job requires him or her to work in an area where such servicing or maintenance is being performed.

Authorized employee. A person who locks or implements a lockout system procedure on machine or equipment to perform the service or maintenance on that machine or equipment. An authorized employee and an affected employee may be the same person when the affected employee's duties also include performing maintenance or service on a machine or equipment which must be locked or tagged out.

"Capable of being locked out". An energy isolating device is considered capable of being locked if it is designed with a hasp or other attachment which a lock can be fastened on or through, or if the device has a locking mechanism built into it. Other energy isolating devices are considered capable of being locked out if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Energized. Connected to an energy source or Containing residual or stored energy

Energy isolating device. A mechanical device that Physically prevents the transmission or release of energy. Examples include: a manually operated electrical circuit breaker, a disconnect switch, a manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply connectors and no pole can be operated independently; a slide gate; a slip blind; a line valve; a block; and any similar device used to block or isolate energy. The term does not include a push button, selector switch, and other control circuit type devices.

Energy source. Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Hot tap. A procedure used in maintenance and service activities which involves welding on a piece of equipment under pressure in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Lockout. The placement of a lockout device on an energy isolating device, in accordance with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout device. A device which utilizes a positive means, such as a lock (key or combination type), to hold an energy isolating device in the safe position and prevent the energizing of a machine or equipment.

YES NO N/A

Normal production operations. The utilization of a machine or equipment to perform its intended production function.

Service and/or maintenance. Workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying, and maintaining or servicing machines or equipment. These activities include lubrication, cleaning, or unjamming of machines or equipment and making adjustments where the employee may be exposed to the unexpected energization or start-up of the equipment or release of hazardous energy.

Setting up. Any work performed to prepare a machine or equipment to perform its normal production operation

Tagout. The placement of a tagout device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

Tagout device. A prominent warning device, such as a tag and a means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tagout device is removed.

(c) General

Before any employee begins service or maintenance work on machinery or equipment where the accidental start-up or release of stored energy could cause injury, has a program consisting of energy control procedures and employee training been established in accordance with paragraph (c)(4) of this section? **(c)(1)**

Lockout/Tagout

If an energy isolating device cannot be locked out, does the energy control program under paragraph (c)(1) of this section utilize a tagout system? **(c)(2)(i)**

If an energy isolating device can be locked out, does the energy control program use a lockout system, unless it can be demonstrated that tagout will provide full protection as provided in paragraph (c)(3) of this section? **(c)(2)(ii)**

Whenever major replacement, repair, renovation, or modification of machines or equipment is performed, or new machinery or equipment is installed, is such machinery or equipment designed to accept a lockout device? **(c)(2)(iii)**

Full Employee Protection

When a tagout device is used on an energy isolating device which is capable of being locked out, is the tagout device attached at the same location the lockout device would have been attached? **(c)(3)(i)**

Has it been demonstrated that the tagout program provides a level of safety equal to that of a lockout program? **(c)(3)(i)**

In demonstrating that the tagout program achieves the same level of safety as a lockout program, have all tagout-related provisions of this standard been applied? **(c)(3)(ii)**

When using a tagout program, are additional safety measures, such as removing an isolating circuit element, blocking a controlling switch, opening an extra disconnecting device, or removing a valve handle, applied? **(c)(3)(ii)**

YES NO N/A

Energy Control Procedure

Have procedures been developed, documented, and utilized for the control of potentially hazardous energy when employees are engaged in activities covered by this section? **(c)(4)(i)**

> **EXCEPTION:** The employer does not need to document required procedures for machines or equipment when all the following provisions exist: 1) there is no potential for stored energy or reaccumulation of stored energy after shutdown; 2) there is a single energy source which can be readily identified and isolated; 3) the isolation and locking out of that energy source will completely de-energize and deactivate the machine or equipment; 4) the machine or equipment is isolated from that energy source and locked out during service or maintenance; 5) a single lockout device will achieve a locked-out condition; 6) the lockout device is under the exclusive control of the authorized employee performing the service or maintenance; 7) the service or maintenance does not create hazards for other employees; and 8) the employer, in utilizing this exception, has had no accidents involving the unexpected activation or re-energization of the machine or equipment during service or maintenance.

Do the energy control procedures clearly and specifically outline the scope, purpose, authorization, rule, and techniques to be used for the control of hazardous energization? **(c)(4)(ii)**

Do the energy control procedures include the following:

- A specified statement of the intended use; **(c)(4)(ii)(A)**
- Steps for shutting down, isolating, blocking, and securing machines or equipment; **(c)(4)(ii)(B)**
- Steps for the placement, removal, and transfer of lockout or tagout devices and the responsibility for them; **(c)(4)(ii)(C)**
- Requirements for testing machines or equipment to verify the effectiveness of a lockout, tagout, or other energy control procedure? **(c)(4)(ii)(D)**

Protective Material and Hardware

Are locks, tags, chains, wedges, key blocks, adapter pins, self locking fasteners, or other hardware provided for isolating, securing, or blocking machines or equipment from energy sources? **(c)(5)(i)**

Are lockout devices singularly identified and used only for controlling energy and not for other purposes? **(c)(5)(ii)**

Are lockout and tagout devices capable of withstanding the environment to which they are exposed for the maximum period of time? **(c)(5)(ii)(A)(1)**

Are tagout devices constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to fade? **(c)(5)(ii)(A)(2)**

Are the tags able to withstand deterioration when used in corrosive environments, such as areas where acid and alkali chemicals are handled? **(c)(5)(ii)(A)(3)**

1910.147 — THE CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)CONFINED SPACES

	YES	NO	N/A
Are lockout devices standardized within the facility in at least one of the following ways: color, shape, or size? **(c)(5)(ii)(B)**			
Are tagout devices standardized in print and in format? **(c)(5)(ii)(B)**			
Lockout Devices Are lockout devices strong enough to prevent removal except in cases of excessive force, such as the use of bolt cutters? **(c)(5)(ii)(C)(1)**			
Tagout Devices Are tagout devices and their means of attachment strong enough to prevent accidental removal? **(c)(5)(ii)(C)(2)**			
Are tagout devices of non-reusable type, attachable by hand, self-locking, and non-releasable with a minimum unlocking strength of no less than 50 pounds? **(c)(5)(ii)(C)(2)**			
Do tagout devices have equivalent strength of one-piece, all environment-tolerant nylon cable ties? **(c)(5)(ii)(C)(2)**			
Do all lockout and tagout devices indicate the identity of the employee applying the device(s)? **(c)(5)(ii)(D)**			
Do tagout devices warn against hazardous conditions if the machine or equipment is energized? **(c)(5)(iii)**			
Does the warning include a legend such as the following: **DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT ENERGIZE, DO NOT OPERATE? (C)(5)(iii)**			
Periodic Inspection Is a periodic inspection of energy control procedures conducted at least annually? **(c)(6)(i)**			
Are periodic inspections conducted by an authorized employee other than the one(so utilizing the energy control procedure being inspected? **(c)(6)(i)(A)**			
Is the periodic inspection designed to correct any deviations or inadequacies observed? **(c)(6)(i)(B)**			
When lockout is used for energy control, does the inspection include a review between the inspector and each affected employee of that employee's responsibility under the energy control procedrue being inspected? **(c)(6)(i)(C)**			
When tagout is used for energy control, does the inspection include a review between the inspector and each affected employee of that employee's responsibility under the energy control program and the elements set forth in paragraph (c)(7)(ii) of this section? **(c)(6)(i)(D)**			
Has the inspection been certified by an authorized employee, and does the certification contain the identity of the machines or equipment for which the energy control procedures are being used, the date of the inspection, the employees included in the inspection, and the person performing the inspection? **(c)(6)(ii)**			
Training and Communication Has training been provided to ensure that the purpose and function of the energy control program are understood by employees? **(c)(7)(i)**			

1910.147 — THE CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)CONFINED SPACES

	YES	NO	N/A
Has each affected employee received training to provide the knowledge and skills required for the safe application, usage and removal of energy controls? **(c)(7)(i)**			
Does the training include the following: **(c)(7)(i)**			
• Employee recognition of applicable hazardous energy sources, the type and magnitude of energy sources in the workplace, and the methods and means necessary for energy isolation and control; **(c)(7)(i)(A)**			
• Employee instruction in the purpose and use of the energy control procedure; **(c)(7)(i)(B)** **AND**			
• Instruction (for all other employees whose work operations may be in an area where energy control procedures may be utilized) about the procedure and the prohibition of restarting or reenergizing machines which are locked out or tagged out? **(c)(7)(i)(C)**			
When tagout systems are used, are employees informed of the following: **(c)(7)(ii)**			
• Tags are warning devices fastened to energy isolating devices, and do not provide the physical restraint that is provided by a lock; **(c)(7)(ii)(A)**			
• When a tag is attached, it's not to be removed, bypassed or ignored, except by authorized employees; **(c)(7)(ii)(B)**			
• Tags are legible and understandable by all affected employees; **(c)(7)(ii)(C)**			
• Tags and their means of attachment are made of material which will withstand environmental conditions encountered in the workplace. **(c)(7)(ii)(D)**			
• Tags may evoke a false sense of security, so their meaning as it applies to the overal energy control program must be understood by all employees; **(c)(7)(ii)(E)** **AND**			
• Tags are securely attached to energy isolating devices, and they cannot be inadvertently or accidentally detached? **(c)(7)(ii)(F)**			
Is retraining provided for all affected employees whenever there is a change in their job assignments; a change in machines, equipment, or processes; a change in the energy control procedures; or when inspection reveals that there are deviations from or inadequacies in the employee's knowledge or use of the energy control procedures? **(c)(7)(iii)(A)**			
Is additional retraining conducted whenever a periodic inspection reveals or the employer believes that the employee's knowledge or use of the energy controls procedures is inadequate? **(c)(7)(iii)(B)**			
Does the retraining reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary? **(c)(7)(iii)(C)**			
Is retraining certified, and does certification contain each employee's name and date of training? **(c)(7)(iv)**			

	YES	NO	N/A
Energy Isolation			
Is the implementation of a lockout or tagout system performed only by authorized employees? (c)(8)			
Are affected employees notified of the application and removal of lockout or tagout devices before the controls are applied and after they are removed from the machine or equipment? (c)(9)			
(d) Application of Control			
Do the established energy control procedures contain the following provisions in sequence: (d)			
(1) *Preparation for shutdown*			
Before an authorized employee turns off a machine or equipment, does he or she know the type and magnitude of the energy, the hazards of the energy to be controlled, and the methods or means to control the energy? (d)(1)			
(2) *Machine or equipment shutdown*			
Are machines or equipment turned off or shut down using the procedures required by this standard. (d)(2)			
(3) *Machine or equipment isolation*			
Are all energy isolating devices that are needed to control the energy to the machine or equipment physically located and operated in such a manner that isolates the machine or equipment from the energy source? (d)(3)			
(4) *Lockout or Tagout Device Application*			
Are lockout or tagout devices fastened on each energy device by an authorized employee? (d)(4)(i)			
When lockout devices are used, are they fastened on in a way that will hold the energy isolating device in a safe or "off" position? (d)(4)(ii)			
Do tagout devices clearly indicate that the operation or movement of the energy isolating device from the "safe" or off position is prohibited? (d)(4)(iii)			
Where tagout devices are used with energy isolating devices which are capable of being locked out, is the tag attachment fastened on at the same point the lock would have been attached? (d)(4)(iii)(A)			
When a tag cannot be fastened on directly to the energy isolating device, is the tag located as close as safely possible to the device in a position that is immediately obvious to anyone attempting to operate the device? (d)(4)(iii)(B)			
(5) *Stored Energy*			
After the application of lockout or tagout device to energy isolating devices, is all potentially hazardous stored or residual energy relieved, disconnected, restrained, and otherwise rendered safe? (d)(5)(i)			
If there is a possibility of reaccumulation of stored energy to a hazardous level, is verification of isolation continued until servicing or maintenance is completed, or until the possibility of such accumulation no longer exists? (d)(5)(ii)			

	YES	NO	N/A
(6) *Verification of Isolation*			
Before working on machines or equipment that have been locked out or tagged out, does the authorized employee verify that isolation and deenergization has been accomplished? (d)(6)			
(e) Release from Lockout or Tagout			
Before lockout or tagout devices are removed and energy is restored to the machine or equipment, have all the following procedures been followed? (e)			
Has the work area been inspected to ensure that nonessential items have been removed and that machine or equipment components are operationally intact? (e)(1)			
Is the work area checked to ensure that all employees have been safely positioned or removed? (e)(2)(i)			
Are affected employees notified that the lockout or tagout device has been removed? (e)(2)(ii)			
Is each lockout or tagout device removed from each energy isolating device by the employee who applied the device? (e)(3)			
EXCEPTION: When the authorized employee who applied the lockout or tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed, documented, and incorporated into the employer's energy control program. The employer shall demonstrate that the specific procedures provide equivalent safety to the removal of the device by the authorized employee who applied it. The specific procedures must include at least the following elements: Verification that the authorized employee who applied the device is not at the facility after having made all reasonable efforts to contact that employee to inform him or her that the lockout or tagout device has been removed; (e)(3)(i)(ii)			
AND Ensuring that the authorized employee has this knowledge before he or she resumes work at that facility. (e)(3)(iii)			
(f) Additional Requirements			
Testing or Position of Machines, Equipment and Their Components			
When lockout or tagout devices have to be removed temporarily from the energy isolating device and the machine or equipment energized to test or position of the machine, equipment, or component thereof, are the following sequence of actions followed: (f)(1)			
• Clear the machine or equipment of tools and material in accordance with paragraph (e)(1) of this section; (f)(1)(i)			
• Remove employees from the machine or equipment area in accordance with paragraph (e)(2) of this section; (f)(1)(ii)			

- Remove all lockout and tagout devices as specified in paragraph (e)(3) of this section; **(f)(1)(iii)**
- Energize and proceed with testing or positioning; **(f)(1)(iv)**

AND

- De-energize all systems and reapply energy control measures in accordance with paragraph (d) of this section to continue the servicing and or maintenance? **(f)(1)(v)**

Outside Personnel/Contractors

Whenever outside servicing personnel are engaged in activities covered by this standard, have the on-site employer and the outside employer informed each other of the respective lockout/tagout procedures? **(f)(2)(i)**

Has the on-site employer ensured that his or her personnel understand and comply with restrictions and prohibitions of the outside employer's energy control procedures? **(f)(2)(ii)**

Group Lockout or Tagout

When servicing or maintenance is performed by a crew, craft, department, or other group, do they use procedures which afford them a level of protection equal to that provided by the implementation of a personal lockout or tagout device? **(f)(3)(i)**

Are group lockout or tagout devices used in accordance with the procedures required by paragraph (c)(4) of this section, including, but not limited to, the following specified requirements: **(f)(3)(ii)**

- Primary responsibility is vested in an authorized employee for a set number of employees working under the protection of a group lockout or tagout device; **(f)(3)(ii)(A)**

- Provisions are made for the authorized employee to ascertain the exposure status of individual group members with regard to the lockout or tagout of the machines or equipment; **(f)(3)(ii)(B)**
- When more than one crew, craft, or department is involved, assignment of overall job-associated lockout or tagout control responsibility is given to an authorized employee designated to coordinate affected work forces and to ensure continuity of protection; **(f)(3)(ii)(C)**

AND

- Each authorized employee has fastened a personal lockout or tagout device to the group lockout device, group lock box, or comparable mechanism when he or she begins work and removes those devices when he or she stops working on the machine or equipment being serviced or maintenanced? **(f)(3)(ii)(D)**

Shift or Personnel Changes

Are specific procedures used during shift or personnel changes to ensure the continuity of lockout or tagout protection, including provision for the orderly transfer of lockout or tagout devices between off-going and oncoming employees, to minimize exposure to hazards from the unexpected energization of machines or equipment or release of stored energy? **(f)(4)**

[Standard 1910.147 is effective January 2, 1990.]

Appendix A — Recommended Color Coding (1910.145)

While the standard does not specifically mandate colors to be used on accident prevention tags, the following color scheme is recommended by OSHA for meeting the requirements of this section:

DANGER — Red, or predominantly red, with lettering or symbols in a contrasting color.

CAUTION — Yellow, or predominantly yellow, with lettering or symbols in a contrasting color.

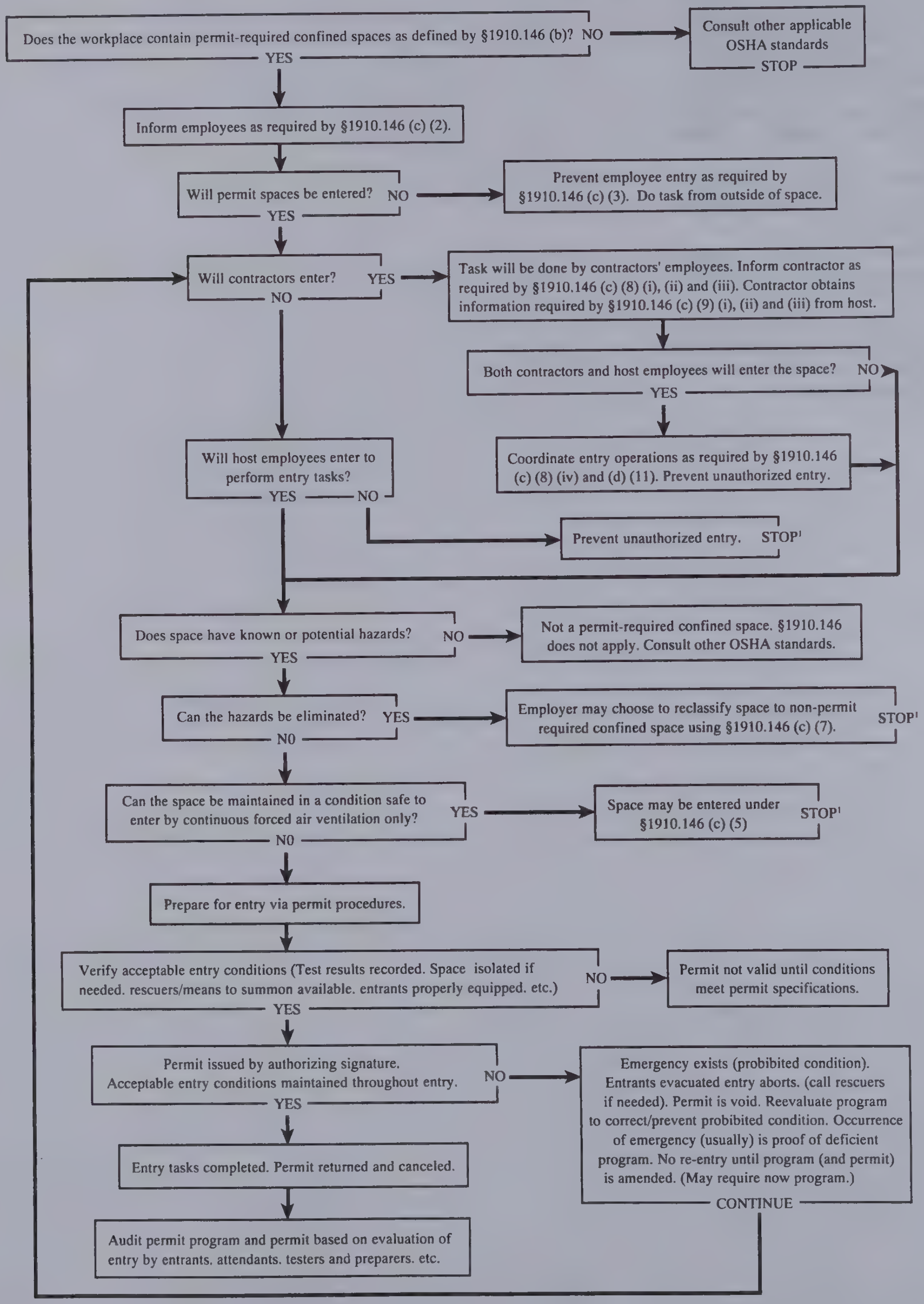
WARNING — Orange — Orange, or predominantly orange, with lettering or symbols in a contrasting color.

BIOLOGICAL HAZARD — Flourescent orange, or orange-red, or predominantly so, with lettering or symbols in a contrasting color.

APPENDICES TO SECTION 1910.146

Note: *Appendices A through E serve to provide information and non-mandatory guidelines to assist employers and employees in complying with the appropriate requirements of this section.*

Appendix A to Section 1910.146 —Permit-required Confined Spaces Flow Chart


Does the workplace contain permit-required confined spaces as defined by §1910.146 (b)?
NO
Consult other applicable OSHA standards
STOP
YES
Inform employees as required by §1910.146 (c) (2).
Will permit spaces be entered?
NO
Prevent employee entry as required by §1910.146 (c) (3). Do task from outside of space.
YES
Will contractors enter?
YES
Task will be done by contractors' employees. Inform contractor as required by §1910.146 (c) (8) (i), (ii) and (iii). Contractor obtains information required by §1910.146 (c) (9) (i), (ii) and (iii) from host.
Both contractors and host employees will enter the space?
NO
YES
Coordinate entry operations as required by §1910.146 (c) (8) (iv) and (d) (11). Prevent unauthorized entry.
NO
Will host employees enter to perform entry tasks?
YES
NO
Prevent unauthorized entry. STOP[1]
Does space have known or potential hazards?
NO
Not a permit-required confined space. §1910.146 does not apply. Consult other OSHA standards.
YES
Can the hazards be eliminated?
YES
Employer may choose to reclassify space to non-permit required confined space using §1910.146 (c) (7).
STOP[1]
NO
Can the space be maintained in a condition safe to enter by continuous forced air ventilation only?
YES
Space may be entered under §1910.146 (c) (5)
STOP[1]
NO
Prepare for entry via permit procedures.
Verify acceptable entry conditions (Test results recorded. Space isolated if needed. rescuers/means to summon available. entrants properly equipped. etc.)
NO
Permit not valid until conditions meet permit specifications.
YES
Permit issued by authorizing signature. Acceptable entry conditions maintained throughout entry.
NO
Emergency exists (probibited condition). Entrants evacuated entry aborts. (call rescuers if needed). Permit is void. Reevaluate program to correct/prevent probibited condition. Occurrence of emergency (usually) is proof of deficient program. No re-entry until program (and permit) is amended. (May require now program.)
CONTINUE
YES
Entry tasks completed. Permit returned and canceled.
Audit permit program and permit based on evaluation of entry by entrants. attendants. testers and preparers. etc.

[1]Space may have to be evacuated and re-evaluated if hazards arise during entry

Appendix B to 1910.146 — Procedures for Atmospheric Testing

Atmospheric testing is required for two distinct purposes: evaluation of the hazards of the permit space and verification that acceptable entry conditions for entry into that space exist.

(1) Evaluation testing. The atmosphere of a confined space should be analyzed using equipment of sufficient sensitivity and specificity to identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space. Evaluation and interpretation of these data, and development of the entry procedure, should be done by, or reviewed by, a technically qualified professional (e.g., OSHA consultation service, or certified industrial hygienist, registered safety engineer, certified safety professional, etc.) based on evaluation of all serious hazards.

(2) Verification testing. The atmosphere of a permit space which may contain a hazardous atmosphere should be tested for residues of all contaminants identified by evaluation testing using permit specified equipment to determine that residual concentrations at the time of testing and entry are within the range of acceptable entry conditions. Results of testing (i.e., actual concentration, etc.) should be recorded on the permit in the space provided adjacent to the stipulated acceptable entry condition.

(3) Duration of testing. Measurement of values for each atmospheric parameter should be made for at least the minimum response time of the test instrument specified by the manufacturer.

(4) Testing stratified atmospheres. When monitoring for entries involving a descent into atmospheres that may be stratified, the atmospheric envelope should be tested a distance of approximately 4 feet (1.22 m) in the direction of travel and to each side. If a sampling probe is used, the entrant's rate of progress should be slowed to accommodate the sampling speed and detector response.

Appendix C to 1910.146 — Examples of Permit-required Confined Space Programs

Example 1.

Workplace. Sewer entry.

Potential hazards. The employees could be exposed to the following:

Engulfment.

Presence of toxic gases. Equal to or more than 10 ppm hydrogen sulfide. If the presence of other toxic contaminants is suspected, specific monitoring programs will be developed.

Presence of explosive/flammable gases. Equal to or greater than 10% of the lower flammable limit (LFL).

Oxygen Deficiency. A concentration of oxygen in the atmosphere equal to or less than 19.5% by volume.

A. ENTRY WITHOUT PERMIT/ATTENDANT Certification. Confined spaces may be entered without the need for a written permit or attendant provided that: 1.) the space is determined not to be a permit required confined space, or 2.) the space can be maintained in a safe condition for entry by mechanical ventilation alone. All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. Any employee required or permitted to pre-check or enter an enclosed/confined space shall have successfully completed, as a minimum, the training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job. The Confined Space Pre-Entry Check List must be completed by the* LEAD WORKER *before entry into a confined space. This list verifies completion of items listed below. This check list shall be kept at the job site for duration of the job. If circumstances dictate an* interruption in the work, the permit space *must be re-evaluated and a new check list must be completed.*

Control of atmospheric and engulfment hazards.

Pumps and Lines. All pumps and lines which may reasonably cause contaminants to flow into the space shall be disconnected, blinded and locked out, or effectively isolated by other means to prevent development of dangerous air contamination or engulfment. Not all laterals to sewers or storm drains require blocking. However, where experience or knowledge of industrial use indicates there is a reasonable potential for contamination of air or engulfment into an occupied sewer, then all affected laterals shall be blocked. If blocking and/or isolation requires entry into the space the provisions for entry into a permit-required confined space must be implemented.

Surveillance. The surrounding area shall be surveyed to avoid hazards such as drifting vapors from the tanks, piping, or sewers.

Testing. The atmosphere within the space will be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. An alarm only type gas monitor may be used. Testing shall be performed by the LEAD WORKER who has successfully completed the Gas Detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL, and hydrogen sulfide concentration. A written record of the pre-entry test results shall be made and kept at the work site for the duration of the job. The supervisor will certify in writing, based upon the results of the pre-entry testing, that all hazards have been eliminated. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in two adjoining, connecting spaces.

Entry Procedures. If there are no non-atmospheric hazards present and if the pre-entry tests show there is no dangerous air contamination and/or oxygen deficiency within the space and there is no reason to believe that any is likely to develop, entry into and work within may proceed. Continuous testing of the atmosphere in the immediate vicinity of the workers within the space shall be accomplished. The workers will immediately leave the permit space when any of the gas monitor alarm set points are reached as defined. Workers will not return to the area until a SUPERVISOR who has completed the gas detector training has used a direct reading gas detector to evaluate the situation and has determined that it is safe to enter.

Rescue. Arrangements for rescue services are not required where there is no attendant. See the rescue portion of section B., below, for instructions regarding rescue planning where an entry permit is required.

B. *ENTRY PERMIT REQUIRED*

Permits. Confined Space Entry Permit. All spaces shall be considered permit-required confined spaces until the pre-entry procedures demonstrate otherwise. Any employee required or permitted to pre-check or enter a permit-required confined space shall have successfully completed, as a minimum, the training as required by the following sections of these procedures. *A written copy of operating and rescue procedures as required by these procedures shall be at the work site for the duration of the job.* The Confined Space Entry Permit must be completed before approval can be given to enter a permit-required confined space. This permit verifies completion of items listed below. This permit shall be kept at the job site for the duration of the job. If circumstances cause an interruption in the work or a change in the alarm conditions for which entry was approved, a new Confined Space Entry Permit must be completed.

Control of atmospheric and engulfment hazards.

Surveillance. The surrounding area shall be surveyed to avoid hazards such as drifting vapors from tanks, piping or sewers.

Testing. The confined space atmosphere shall be tested to determine whether dangerous air contamination and/or oxygen deficiency exists. A direct reading gas monitor shall be used.

Testing shall be performed by the SUPERVISOR who has successfully completed the gas detector training for the monitor he will use. The minimum parameters to be monitored are oxygen deficiency, LFL and hydrogen sulfide concentration. A written record of the pre- entry test results shall be made and kept at the work site for the duration of the job. Affected employees shall be able to review the testing results. The most hazardous conditions shall govern when work is being performed in two adjoining, connected spaces.

Space Ventilation. Mechanical ventilation systems, where applicable, shall be set at 100% outside air. Where possible, open additional manholes to increase air circulation. Use portable blowers to augment natural circulation if needed. After a suitable ventilating period, repeat the testing. Entry may not begin until testing has demonstrated that the hazardous atmosphere has been eliminated.

Entry Procedures. The following procedure shall be observed under any of the following conditions: 1.) Testing demonstrates the existence of dangerous or deficient conditions and additional ventilation cannot reduce concentrations to safe levels; 2.) The atmosphere tests as safe but unsafe conditions can reasonably be expected to develop; 3.) It is not feasible to provide for ready exit from spaces equipped with automatic fire suppression systems and it is not practical or safe to deactivate such systems; or 4.) An emergency exists and it is not feasible to wait for pre-entry procedures to take effect.

All personnel must be trained. A self contained breathing apparatus shall be worn by any person entering the space. At least one worker shall stand by the outside of the space ready to give assistance in case of emergency. The standby worker shall have a self contained breathing apparatus available for immediate use. There shall be at least one additional worker within sight or call of the standby worker. Continuous powered communications shall be maintained between the worker within the confined space and standby personnel.

If at any time there is any questionable action or non-movement by the worker inside, a verbal check will be made. If there is no response, the worker will be moved immediately. *Exception:* If the worker is disabled due to falling or impact, he/she shall not be removed from the confined space unless there is immediate danger to his/her life. Local fire department rescue personnel shall be notified immediately. The standby worker may only enter the confined space in case of an emergency (wearing the self contained breathing apparatus) and only after being relieved by another worker. Safety belt or harness with attached lifeline shall be used by all workers entering the space with the free end of the line secured outside the entry opening. The standby worker shall attempt to remove a disabled worker via his lifeline before entering the space.

When practical, these spaces shall be entered through side openings — those within 3½ feet (1.07 m) of the bottom. When entry must be through a top opening, the safety belt shall be of the harness type that suspends a person upright and a hoisting device or similar apparatus shall be available for lifting workers out of the space.In any situation where their use may endanger the worker, use of a hoisting device or safety belt and attached lifeline may be discontinued.

When dangerous air contamination is attributable to flammable and/or explosive substances, lighting and electrical equipment shall be Class 1, Division 1 rated per National Electrical Code and no ignition sources shall be introduced into the area.

Continuous gas monitoring shall be performed during all confined space operations. If alarm conditions change adversely, entry personnel shall exit the confined space and a new confined space permit issued.

Rescue. Call the fire department services for rescue. Where immediate hazards to injured personnel are present, workers at the site shall implement emergency procedures to fit the situation.

Example 2.

Workplace. Meat and poultry rendering plants.

Cookers and dryers are either batch or continuous in their operation. Multiple batch cookers are operated in parallel. When one unit of a multiple set is shut down for repairs, means are available to isolate that unit from the others which remain in operation.

Cookers and dryers are horizontal, cylindrical vessels equipped with a center, rotating shaft and agitator paddles or discs. If the inner shell is jacketed, it is usually heated with steam at pressures up to 150 psig (1034.25 kPa). The rotating shaft assembly of the continuous cooker or dryer is also steam heated.

Potential Hazards. The recognized hazards associated with cookers and dryers are the risk that employees could be:

1. Struck or caught by rotating agitator;

2. Engulfed in raw material or hot, recycled fat;

3. Burned by steam from leaks into the cooker/dryer steam jacket or the condenser duct system if steam valves are not properly closed and locked out;

4. Burned by contact with hot metal surfaces, such as the agitator shaft assembly, or inner shell of the cooker/dryer;

5. Heat stress caused by warm atmosphere inside cooker/dryer;

6. Slipping and falling on grease in the cooker/dryer;

7. Electrically shocked by faulty equipment taken into the cooker/dryer;

8. Burned or overcome by fire or products of combustion; or

9. Overcome by fumes generated by welding or cutting done on grease covered surfaces.

Permits. The supervisor in this case is always present at the cooker/dryer or other permit entry confined space when entry is made. The supervisor must follow the pre-entry isolation procedures described in the entry permit in preparing for entry, and ensure that the protective clothing, ventilating equipment and any other equipment required by the permit are at the entry site.

Control of hazards. Mechanical. Lock out main power switch to agitator motor at main power panel. Affix tag to the lock to inform others that a permit entry confined space entry is in progress.

Engulfment. Close all valves in the raw material blow line. Secure each valve in its closed position using chain and lock. Attach a tag to the valve and chain warning that a permit entry confined space entry is in progress. The same procedure shall be used for securing the fat recycle valve.

Burns and heat stress. Close steam supply valves to jacket and secure with chains and tags. Insert solid blank at flange in cooker vent line to condenser manifold duct system. Vent cooker/dryer by opening access door at discharge end and top center door to allow natural ventilation throughout the entry. If faster cooling is needed, use an portable ventilation fan to increase ventilation. Cooling water may be circulated through the jacket to reduce both outer and inner surface temperatures of cooker/dryers faster. Check air and inner surface temperatures in cooker/dryer to assure they are within acceptable limits before entering, or use proper protective clothing.

Fire and fume hazards. Careful site preparation, such as cleaning the area within 4 inches (10.16 cm) of all welding or torch cutting operations, and proper ventilation are the preferred controls. All welding and cutting operations shall be done in accordance with the requirements of 29 CFR Part 1910, Subpart Q, OSHA's welding standard. Proper ventilation may be achieved by local exhaust ventilation, or the use of portable ventilation fans, or a combination of the two practices.

Electrical shock. Electrical equipment used in cooker/dryers shall be in serviceable condition.

Slips and falls. Remove residual grease before entering cooker/dryer.

Attendant. The supervisor shall be the attendant for employees entering cooker/dryers.

Permit. The permit shall specify how isolation shall be done and any other preparations needed before making entry. This is especially important in parallel arrangements of cooker/dryers so that the entire operation need not be shut down to allow safe entry into one unit.

Rescue. When necessary, the attendant shall call the fire department as previously arranged.

Example 3.

Workplace. Workplaces where tank cars, trucks, and trailers, dry bulk tanks and trailers, railroad tank cars, and similar portable tanks are fabricated or serviced.

A. During fabrication. These tanks and dry-bulk carriers are entered repeatedly throughout the fabrication process. These products are not configured identically, but the manufacturing processes by which they are made are very similar.

Sources of hazards. In addition to the mechanical hazards arising from the risks that an entrant would be injured due to contact with components of the tank or the tools being used, there is also the risk that a worker could be injured by breathing fumes from welding materials or mists or vapors from materials used to coat the tank interior. In addition, many of these vapors and mists are flammable, so the failure to properly ventilate a tank could lead to a fire or explosion.

Control of hazards.

Welding. Local exhaust ventilation shall be used to remove welding fumes once the tank or carrier is completed to the point that workers may enter and exit only through a manhole. (Follow the requirements of 29 CFR 1910, Subpart Q, OSHA's welding standard, at all times.) Welding gas tanks may never be brought into a tank or carrier that is a permit entry confined space.

Application of interior coatings/linings. Atmospheric hazards shall be controlled by forced air ventilation sufficient to keep the atmospheric concentration of flammable materials below 10% of the lower flammable limit (LFL), or lower explosive limit (LEL), whichever term is used locally). The appropriate respirators are provided and shall be used in addition to providing forced ventilation if the forced ventilation does not maintain acceptable respiratory conditions.

Permits. Because of the repetitive nature of the entries in these operations, an "Area Entry Permit" will be issued for a 1 month period to cover those production areas where tanks are fabricated to the point that entry and exit are made using manholes.

Authorization. Only the area supervisor may authorize an employee to enter a tank within the permit area. The area supervisor must determine that conditions in the tank trailer, dry bulk trailer or truck, etc. meet permit requirements before authorizing entry.

Attendant. The area supervisor shall designate an employee to maintain communication by employer specified means with employees working in tanks to ensure their safety. The attendant may not enter any permit entry confined space to rescue an entrant or for any other reason, unless authorized by the rescue procedure and, and even then, only after calling the rescue team and being relieved by as attendant by another worker.

Communications and observation. Communications between attendant and entrant(s) shall be maintained throughout entry. Methods of communication that may be specified by the permit include voice, voice powered radio, tapping or rapping codes on tank walls, signalling tugs on a rope, and the attendant's observation that work activities such as chipping, grinding, welding, spraying, etc., which require deliberate operator control continue normally. These activities often generate so much noise that the necessary hearing protection makes communication by voice difficult.

Rescue procedures. Acceptable rescue procedures include entry by a team of employee-rescuers, use of public emergency services, and procedures for breaching the tank. The area permit specifies which procedures are available, but the area supervisor makes the final decision based on circumstances. (Certain injuries may make it necessary to breach the tank to remove a person rather than risk additional injury by removal through an existing manhole. However, the supervisor must ensure that no breaching procedure used for rescue would violate terms of the entry permit. For instance, if the tank must be breached by cutting with a torch, the tank surfaces to be cut must be free of volatile or combustible coatings within 4 inches (10.16 cm) of the cutting line and the atmosphere within the tank must be below the LFL.

Retrieval line and harnesses. The retrieval lines and harnesses generally required under this standard are usually impractical for use in tanks because the internal configuration of the tanks and their interior baffles and other structures would prevent rescuers from hauling out injured entrants. However, unless the rescue procedure calls for breaching the tank for rescue, the rescue team shall be trained in the use of retrieval lines and harnesses for removing injured employees through manholes.

B. *Repair or service of "used" tanks and bulk trailers.*

Sources of hazards. In addition to facing the potential hazards encountered in fabrication or manufacturing, tanks or trailers which have been in service may contain residues of dangerous materials, whether left over from the transportation of hazardous cargoes or generated by chemical or bacterial action on residues of non-hazardous cargoes.

Control of atmospheric hazards. A "used" tank shall be brought into areas where tank entry is authorized only after the tank has been emptied, cleansed (without employee entry) of any residues, and purged of any potential atmospheric hazards.

Welding. In addition to tank cleaning for control of atmospheric hazards, coating and surface materials shall be removed 4 inches (10.16 cm) or more from any surface area where welding or other torch work will be done and care taken that the atmosphere within the tank remains well below the LFL. (Follow the requirements of 29 CFR 1910, Subpart Q, OSHA's welding standard, at all times.)

Permits. An entry permit valid for up to 1 year shall be issued prior to authorization of entry into used tank trailers, dry bulk trailers or trucks. In addition to the pre-entry cleaning requirement, this permit shall require the employee safeguards specified for new tank fabrication or construction permit areas.

Authorization. Only the area supervisor may authorize an employee to enter tank trailer, dry bulk trailer or truck within the permit area. The area supervisor must determine that the entry permit requirements have been met before authorizing entry.

Appendix D — 1A

Sewer Entry Permit

Confined Space Pre-Entry Check List

See Safety Procedure.
A confined space either is entered through an opening other than a door (such as manhole or side port) or requires the use of a ladder or rungs to reach the working level and test results are satisfactory. This check list must be filled out whenever the job site meets this criteria.

		Yes	No
1.	Did your survey of the surrounding area show it to be free of hazards such as drifting vapors from tanks, piping or sewers?	( )	( )
2.	Does your knowledge of industrial or other discharges indicate this area is likely to remain free of dangerous air contaminants while occupied?	( )	( )
3.	Are you certified in operation of the gas monitor to be used?	( )	( )
4.	Has a gas monitor functional test (Bump Test) been performed this shift on the gas monitor to be used?	( )	( )
5.	Did you test the atmosphere of the confined space prior to entry?	( )	( )
6.	Did the atmosphere check as acceptable (no alarms given)?	( )	( )
7.	Will the atmosphere be continuously monitored while the space is occupied?	( )	( )

Contact County Centrex for personnel rescue by local fire department in the event of an emergency. If on-site at the Regional Treatment Plant, contact the Plant Control Center (PCC).

Notice: If any of the above questions are answered "no" do not enter. Contact your immediate supervisor.

Job Location ______________________________

LEAD MAN signature ______________________________ Date ______________

APPENDIX D — 1B

Confined Space Entry Permit (Pre-Entry/Entry Check List)

Date and Time
Issued: ______

Job site: ______

Equipment to be worked on: ______

Pre-Entry (See Safety Procedure)

1. Atmospheric Checks: Time ______
Oxygen ______ %
Explosive ______ % L.F.L.
Toxic ______ PPM

2. Source isolation (No Entry):	N/A	Yes	No
Pumps or lines blinded,	( )	( )	( )
disconnected, or blocked	( )	( )	( )
3. Ventilation Modification:	N/A	Yes	No
Mechanical	( )	( )	( )
Natural Ventilation only	( )	( )	( )

4. Atmospheric check after Isolation and Ventilation:

Oxygen ______	%	>	19.5	%
Explosive ______	% L.F.L.	<	10	%
Toxic ______	PPM	<	10	PPM H_2S
Time ______				

If conditions are in compliance with the above requirements and there is no reason to believe conditions may change adversely, then proceed to the Permit Space Pre-Entry Check List. Complete and post with this permit. If conditions are not in compliance with the above requirements or there is reason to believe that conditions may change adversely, proceed to the Entry Check-List portion of this permit.

Date and Time Expires: ______

Job Supervisor ______

Work to be performed: ______

Entry (See Safety Procedure)

	N/A	Yes	No
1. Entry, standby, and back up persons: Successfully completed required training? Is it current?		( )	( )
2. Equipment:	N/A	Yes	No
Direct reading gas monitor — tested	( )	( )	( )
Safety harnesses and lifelines for entry and standby persons	( )	( )	( )
Hoisting equipment	( )	( )	( )
Powered communications	( )	( )	( )
SCBA's for entry and standby persons	( )	( )	( )
Protecting Clothing	( )	( )	( )
All electric equipment listed Class I, Division I, Group D and Non-sparking tools	( )	( )	( )

Rescue Procedure:

______

______

______

______

______

______

We have reviewed the work authorized by this permit and the information contained here-in. Written instructions and safety procedures have been received and are understood. Entry cannot be approved if any squares are marked in the "No" column. This permit is not valid unless all appropriate items are completed.

Permit and Check List Prepared By: (Supervisor) ______

Approved By: (Unit Supervisor) ______

Reviewed By (Confined Space Operations Personnel) : (printed name & signature)

______ ______

This permit to be kept at job site. Return job site copy to Safety Office following job completion.
Copies: White Original (Safety Office) Yellow (Unit Supervisor) Hard (Job site)

APPENDIX D – 2

ENTRY PERMIT

_______ CONFINED SPACE _______ HAZARDOUS AREA

PERMIT VALID FOR 8 HOURS ONLY. ALL COPIES OF PERMIT WILL REMAIN AT JOB SITE UNTIL JOB IS COMPLETED

SITE LOCATION and DESCRIPTION ____________________

PURPOSE OF ENTRY ____________________

SUPERVISOR(S) in charge of crews   Type of Crew Phone #

* BOLD DENOTES MINIMUM REQUIREMENTS TO BE COMPLETED AND REVIEWED PRIOR TO ENTRY*

REQUIREMENTS COMPLETED	DATE	TIME	REQUIREMENTS COMPLETED	DATE	TIME
Lock Out/De-energize/Try-out	____	____	Full Body Harness w/"D" ring	____	____
Line(s) Broken-Capped-Blanked	____	____	Emergency Escape Retrieval Equip	____	____
Purge-Flush and Vent	____	____	Lifelines	____	____
Ventilation	____	____	Fire Extinguishers	____	____
Secure Area (Post and Flag)	____	____	Lighting (Explosive Proof)	____	____
Breathing Apparatus	____	____	Protective Clothing	____	____
Resuscitator – Inhalator	____	____	Respirator(s) (Air Purifying)	____	____
Standby Safety Personnel	____	____	Burning and Welding Permit	____	____

Note: Items that do not apply enter N/A in the blank.

**RECORD CONTINUOUS MONITORING RESULTS EVERY 2 HOURS

CONTINUOUS MONITORING** TEST(S) TO BE TAKEN	Permissible Entry Level									
PERCENT OF OXYGEN	19.5% to 23.5%		____	____	____	____	____	____	____	____
LOWER FLAMMABLE LIMIT	Under 10%		____	____	____	____	____	____	____	____
CARBON MONOXIDE	+35 PPM		____	____	____	____	____	____	____	____
Aromatic Hydrocarbon	+ 1 PPM	* 5PPM	____	____	____	____	____	____	____	____
Hydrogen Cyanide	(Skin)	* 4PPM	____	____	____	____	____	____	____	____
Hydrogen Sulfide	+10 PPM	*15PPM	____	____	____	____	____	____	____	____
Sulfur Dioxide	+ 2 PPM	* 5PPM	____	____	____	____	____	____	____	____
Ammonia		*35PPM	____	____	____	____	____	____	____	____

*Short-term exposure limit:Employee can work in the area up to 15 minutes.

+8 hr. Time Weighted Avg.:Employee can work in area 8 hrs (longer with appropriate respiratory protection).

REMARKS: ____________________

GAS TESTER NAME & CHECK #	INSTRUMENT(S) USED	MODEL &/OR TYPE	SERIAL &/OR UNIT #
____	____	____	____
____	____	____	____

SAFETY STANDBY PERSON IS REQUIRED FOR ALL CONFINED SPACE WORK

SAFETY STANDBY PERSON(S)	CHECK #	NAME OF SAFETY STANDBY PERSON(S)	CHECK #
____	____	____	____
____	____	____	____

SUPERVISOR AUTHORIZING ENTRY

ALL ABOVE CONDITIONS SATISFIED ____________________

AMBULANCE	2800	FIRE 2900
Safety	4901	Gas Coordinator 4529/5387

DEPARTMENT ____________________ Phone ____________________ Original to Department Pink Copy to Safety

Appendix E to 1910.146 — Sewer System Entry.

Sewer entry differs in three vital respects from other permit entries; first, there rarely exists any way to completely isolate the space (a section of a continuous system) to be entered; second, because isolation is not complete, the atmosphere may suddenly and unpredictably become lethally hazardous (toxic, flammable or explosive) from causes beyond the control of the entrant or employer, and third, experienced sewer workers are especially knowledgeable in entry and work in their permit spaces because of their frequent entries. Unlike other employments where permit space entry is a rare and exceptional event, sewer workers' usual work environment is a permit space.

(1) *Adherence to procedure.* The employer should designate as entrants only employees who are thoroughly trained in the employer's sewer entry procedures and who demonstrate that they follow these entry procedures exactly as prescribed when performing sewer entries.

(2) *Atmospheric monitoring.* Entrants should be trained in the use of, and be equipped with, atmospheric monitoring equipment which sounds an audible alarm, in addition to its visual readout, whenever one of the following conditions is encountered: oxygen concentration less than 19.5 percent; flammable gas or vapor at 10 percent or more of the lower flammable limit (LFL); or hydrogen sulfide or carbon monoxide at or above their PEL (10 ppm or 50 ppm, respectively); or, if a broad range sensor device is used, at 100 ppm as characterized by its response to toluene. Normally, the oxygen sensor/broad range sensor instrument is best suited for sewer entry. However, substance specific devices should be used whenever actual contaminants have been identified. The instrument should be carried and used by the entrant in sewer line work to monitor the atmosphere in the entrant's environment, and in advance of the entrants' direction of movement, to warn the entrant of any deterioration in atmospheric conditions. Where several entrants are working together in the same immediate location, one instrument, used by the lead entrant, is acceptable.

(3) *Surge flow and flooding.* Sewer crews should develop and maintain liaison, to the extent possible, with the local weather bureau and fire and emergency services in their area so that sewer work may be delayed or interrupted and entrants withdrawn whenever sewer lines might be suddenly flooded by rain or fire suppression activities, or whenever flammable or other hazardous materials are released into sewers during emergencies by industrial or transportation accidents.

(4) *Special Equipment.* Entry into large bore sewers may require the use of special equipment. Such equipment might include such items as atmosphere monitoring devices with automatic audible alarms, escape self-contained breathing apparatus (ESCBA) with at least 10 minute air supply (or other NIOSH approved self-rescuer), and waterproof flashlights, and may also include boats and rafts, radios and rope stand-offs for pulling around bends and corners as needed.

OVERVIEW: SUBPART K

MEDICAL AND FIRST AID

This section applies to all workplaces and sets requirements for medical and first aid services, as well as for emergency eye and face washes and drench showers.

Std. No. **Page No.**

1910.151 **Medical services and first aid** K-01

T3

1910.151 — MEDICAL SERVICES AND FIRST AID

	YES	NO
Are provisions made to insure the availability of medical personnel for advice and consultation on matters of plant health? **(a)**		
Is a person or persons adequately trained to render first aid available in the absence of an infirmary, clinic, or hospital in near proximity to the workplace, which is used for the treatment of all injured employees? **(b)**		
Are first aid supplies approved by the consulting physician readily available? **(b)**		
Are suitable facilities for quick drenching or flushing of the eyes and body provided where the eyes or body of any person may be exposed to injurious corrosive materials? **(c)**		

OVERVIEW: SUBPART L

FIRE PROTECTION

This subpart applies to all workplaces except maritime, agriculture, and construction. It outlines requirements for fire brigades, portable and fixed fire suppression equipment, and fire detection and alarm systems.

Section 1910.156, Fire Brigades, outlines requirements for the organization, training, and personal protective equipment of employee fire brigades. It is not mandatory that employers establish a fire brigade, but those that do must adhere to the specifications of this section. This part also applies to industrial fire departments and private or contractual fire departments; but not to airport crash rescue or forest fire fighting operations.

The requirements of 1910.157, Portable Fire Extinguishers, apply to the placement, use, maintenance, and testing of portable fire extinguishers intended for employee use. Full compliance with this standard is necessary whenever another part of the OSHA standards requires fire extinguishers, for example, in welding operations. If all employees are authorized to use fire extinguishers, full compliance is also necessary. If fire extinguishers are available, but may only be used by certain selected employees while other employees evacuate, all sections apply except the distribution requirements. If fire extinguishers are provided but are not intended for employee use, the testing and maintenance requirements only apply. Should an employer decide that in the case of fire all employees shall evacuate, and both the evacuation and fire prevention plans meet the requirements of 1910.38, Subpart E, then this section does not apply and the employer need not provide fire extinguishers.

Sections 1910.158-1910.163 cover the design, maintenance, and testing of fixed fire suppression systems. Only when an establishment is required by another OSHA standard to install fixed fire suppression equipment do the requirements of this section apply. Systems that have been installed but are not required by OSHA are exempt, except when the system's discharge may adversely affect employees. In this case, general requirements for warning and inspection apply (b.4-b.7 and c, page L-10).

Likewise, the requirements of 1910.164, Fire Detection Systems, and 1910.165, Employee Alarm Systems only apply to systems installed to meet the requirements of an OSHA standard. 1910.165 does not apply to discharge or supervisory alarm on fixed extinguishing, fire suppression, alarm, or detection systems unless these alarms also function as employee alarm. The maintenance, testing, and inspection requirements of 1910.165 apply to local fire alarm systems used to alert employees.

Specific sections of the standards covered in the checklist are:

Std. No.		**Page No.**
1910.155	**Scope, application, and definitions applicable to this subpart**	L-01
1910.156	**Fire brigades**	L-03
1910.157	**Portable fire extinguishers**	L-05
1910.158	**Standpipe and hose systems**	L-08
1910.159	**Automatic sprinkler systems**	L-08
1910.160	**Fixed extinguishing systems, general**	L-10
1910.161	**Fixed extinguishing systems, dry chemical**	L-10
1910.162	**Fixed extinguishing systems, gaseous agent**	L-11
1910.163	**Fixed extinguishing systems, water, spray and foam**	L-11
1910.164	**Fire detection systems**	L-11
1910.165	**Employee alarm systems**	L-12
	Monthly fire extinguisher inspection guide	L-13

1910.155 — SCOPE, APPLICATION AND DEFINITIONS APPLICABLE TO THIS SUBPART

YES NO

(a) Scope.

This subpart contains requirements for fire brigades, and all portable and fixed fire suppression equipment, fire detection systems, and fire or employee alarm systems installed to meet the fire protection requirements of 29 CFR Part 1910.

(b) Application.

This subpart applies to all employments except for maritime, construction, and agriculture.

(c) Definitions applicable to this subpart.

"After-flame" means the time a test specimen continues to flame after the flame source has been removed. **(c)(1)**

"Aqueous film forming foam (AFFF)" means a fluorinated surfactant with a foam stabilizer which is diluted with water to act as a temporary barrier to exclude air from mixing with the fuel vapor by developing an aqueous film on the fuel surface of some hydrocarbons which is capable of suppressing the generation of fuel vapors. **(c)(2)**

"Approved" means acceptable to the Assistant Secretary under the following criteria:

(i) If it is accepted, or certified, or listed, or labeled or otherwise determined to be safe by a nationally recognized testing laboratory [**revised 1988**]; or **(c)(3)(i)**

(ii) With respect to an installation or equipment of a kind which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another federal agency and found in compliance with the provisions of the applicable National Fire Protection Association Fire Code; or **(c)(3)(ii)**

(iii) With respect to custom-made equipment or related installations which are designed, fabricated for, and intended for use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection to the Assistant Secretary. **(c)(3)(iii)**

(iv) For the purposes of paragraph (c)(3) of this section:

  (A) Equipment is listed if it is of a kind mentioned in a list which is published by a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment and which states that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner; **(c)(3)(iv)(A)**

  (B) Equipment is labeled if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment, and whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner; **(c)(3)(iv)(B)**

  (C) Equipment is accepted if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes; and **(c)(3)(iv)(C)**

  (D) Equipment is certified if it has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner or is of a kind whose production is periodically inspected by a nationally recognized testing laboratory, and if it bears a label, tag, or other record of certification. **(c)(3)(iv)(D)**

1910.155 — SCOPE, APPLICATION AND DEFINITIONS APPLICABLE TO THIS SUBPART

YES NO

  (E) Refer to Section 1910.7 for definition of nationally recognized testing laboratory. [Added 1988] **(c)(3)(iv)(E)**

"Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health or designee. **(c)(4)**

"Automatic fire detection device" means a device designed to automatically detect the presence of fire by heat, flame, light, smoke or other products of combustion. **(c)(5)**

"Buddy-breathing device" means an accessory to self-contained breathing apparatus which permits a second person to share the same air supply as that of the wearer of the apparatus. **(c)(6)**

"Carbon dioxide" means a colorless, odorless, electrically nonconductive inert gas (chemical formula CO_2) that is a medium for extinguishing fires by reducing the concentration of oxygen or fuel vapor in the air to the point where combustion is impossible. **(c)(7)**

"Class A fire" means a fire involving ordinary combustible materials such as paper, wood, cloth, and some rubber and plastic materials. **(c)(8)**

"Class B fire" means a fire involving flammable or combustible liquids, flammable gases, greases and similar materials, and some rubber and plastic materials. **(c)(9)**

"Class C fire" means a fire involving energized electrical equipment where safety to the employee requires the use of electrically nonconductive extinguishing media. **(c)(10)**

"Class D fire" means a fire involving combustible metals such as magnesium, titanium, zirconium, sodium, lithium and potassium. **(c)(11)**

"Dry chemical" means an extinguishing agent composed of very small particles of chemicals such as, but not limited to, sodium bicarbonate, potassium bicarbonate, urea-based potassium bicarbonate, potassium chloride, or monoammonium phosphate supplemented by special treatment to provide resistance to packing and moisture absorption (caking) as well as to provide proper flow capabilities. Dry chemical does not include dry powders. **(c)(12)**

"Dry powder" means a compound used to extinguish or control Class D fires. **(c)(13)**

"Education" means the process of imparting knowledge or skill through systematic instruction. It does not require normal classroom instruction. **(c)(14)**

"Enclosed structure" means a structure with a roof or ceiling and at least two walls which may present fire hazards to employees, such as accumulations of smoke, toxic gases and heat, similar to those found in buildings. **(c)(15)**

"Extinguisher classification" means the letter classification given an extinguisher to designate the class or classes of fire on which an extinguisher will be effective. **(c)(16)**

"Extinguisher rating" means the numerical rating given to an extinguisher which indicates the extinguishing potential of the unit based on standardized tests developed by Underwriters' Laboratories, Inc. **(c)(17)**

T4

1910.155 — SCOPE, APPLICATION AND DEFINITIONS APPLICABLE TO THIS SUBPART

YES NO

"Fire brigade" (private fire department, industrial fire department) means an organized group of employees who are knowledgeable, trained, and skilled in at least basic fire fighting operations. **(c)(18)**

"Fixed extinguishing system" means a permanently installed system that either extinguishes or controls a fire at the location of the system. **(c)(19)**

"Flame resistance" is the property of materials, or combinations of component materials, to retard ignition and restrict the spread of flame. **(c)(20)**

"Foam" means a stable aggregation of small bubbles which flow freely over a burning liquid surface and form a coherent blanket which seals combustible vapors and thereby extinguishes the fire. **(c)(21)**

"Gaseous agent" is a fire extinguishing agent which is in the gaseous state at normal room temperature and pressure. It has low viscosity, can expand or contract with changes in pressure and temperature, and has the ability to diffuse readily and to distribute itself uniformly throughout an enclosure. **(c)(22)**

"Halon 1211" means a colorless, faintly sweet smelling, electrically nonconductive liquefied gas which is a medium for extinguishing fires by inhibiting the chemical chain reaction of fuel and oxygen. It is also known as bromochlorodifluoromethane. **(c)(23)**

"Halon 1301" means a colorless, odorless, electrically nonconductive gas which is a medium for extinguishing fires by inhibiting the chemical chain reaction of fuel and oxygen. It is also known as bromotrifluoromethane. **(c)(24)**

"Helmet" is a head protective device consisting of a rigid shelf, energy absorption system, and chin strap intended to be worn to provide protection for the head or portions thereof, against impact, flying or falling objects, electric shock, penetration, heat, and flame. **(c)(25)**

"Incipient stage fire" means a fire which is in the initial or beginning stage and which can be controlled or extinguished by portable fire extinguishers, Class II standpipe or small hose systems without the need for protective clothing or breathing apparatus. **(c)(26)**

"Inspection" means a visual check of fire protection systems and equipment to ensure that they are in place, charged, and ready for use in the event of a fire. **(c)(27)**

"Interior structural fire fighting" means the physical activity of fire suppression, rescue or both, inside of buildings or enclosed structures which are involved in a fire situation beyond the incipient stage. **(c)(28)**

"Lining" means a material permanently attached to the inside of the outer shell of a garment for the purpose of thermal protection and padding. **(c)(29)**

"Local application system" means a fixed fire suppression system which has a supply of extinguishing agent, with nozzles arranged to automatically discharge extinguishing agent directly on the burning material to extinguish or control a fire. **(c)(30)**

"Maintenance" means the performance of services on the fire protection equipment and systems to assure that they will perform as expected in the event of a fire. Maintenance differs from inspection in that maintenance requires the checking of internal fittings, devices, and agent supplies. **(c)(31)**

1910.155 — SCOPE, APPLICATION AND DEFINITIONS APPLICABLE TO THIS SUBPART

YES NO

"Multipurpose dry chemical" means a dry chemical which is approved for use on Class A, Class B, and Class C fires. **(c)(32)**

"Outer shell" is the exterior layer of material on the fire coat and protective trousers which forms the outermost barrier between the fire fighter and the environment. It is attached to the vapor barrier and liner and is usually constructed with a storm flap, suitable closures, and pockets. **(c)(33)**

"Positive-pressure breathing apparatus" means self-contained breathing apparatus in which the pressure in the breathing zone is positive in relation to the immediate environment during inhalation and exhalation. **(c)(34)**

"Pre-discharge employee alarm" means an alarm which will sound at a set time prior to actual discharge of an extinguishing system so that employees may evacuate the discharge area prior to system discharge. **(c)(35)**

"Quick disconnect valve" means a device which starts the flow of air by inserting the hose (which leads from the face piece) into the regulator of a self-contained breathing apparatus, and stops the flow of air by disconnecting the hose from the regulator. **(c)(36)**

"Sprinkler alarm" means an approved device installed so that any water flow from a sprinkler system equal to or greater than that from single automatic sprinkler will result in an audible alarm signal on the promises. **(c)(37)**

"Sprinkler system" means a system of piping designed in accordance with fire protection engineering standards and installed to control or extinguish fires. The system includes an adequate and reliable water supply, and a network of specially sized piping and sprinklers which are interconnected. The system also includes a control valve and a device for actuating an alarm when the system is in operation. **(c)(38)**

"Standpipe systems"

(i) "Class I standpipe system" means a 2½" (6.3 cm) hose connection for use by fire departments and those trained in handling heavy fire streams. **(c)(39)(i)**

(ii) "Class II standpipe system" means a 1½" (3.8 cm) hose system which provides a means for the control or extinguishment of incipient stage fires. **(c)(39)(ii)**

(iii) "Class III standpipe system" means a combined system of hose which is for the use of employees trained in the use of hose operations and which is capable of furnishing effective water discharge during the more advanced stages of fire (beyond the incipient stage) in the interior of workplaces. Hose outlets are available for both 1½" (3.8 cm) and 2½" (6.3 cm) hose. **(c)(39)(iii)**

"Small hose system" means a system of hose ranging in diameter from ⅝" (1.6 cm) up to 1½" (3.8 cm) which is for the use of employees and which provides a means for the control and extinguishment of incipient stage fires. **(c)(39)(iv)**

"Total flooding system" means a fixed suppression system which is arranged to automatically discharge a predetermined concentration of agent into an enclosed space for the purpose of fire extinguishment or control. **(c)(40)**

"Training" means the process of making proficient through instruction and hands-on practice in the operation of equipment, including respiratory protection equipment, that is expected to be used in the performance of assigned duties. **(c)(41)**

1910.155 — SCOPE, APPLICATION AND DEFINITIONS APPLICABLE TO THIS SUBPART

YES NO

"Vapor barrier" means that material used to prevent or substantially inhibit the transfer of water, corrosive liquids and steam or other hot vapors from the outside of a garment to the wearer's body. (c)(42)

1910.156 — FIRE BRIGADES

(a) Scope and application

Scope. (a)(1)

This section contains requirements for the organization, training, and personal protective equipment of fire brigades whenever they are established by an employer. (a)(1)

Application. (a)(2)

The requirements of this section apply to fire brigades, industrial fire departments and private or contractual type fire departments.

Personal protective equipment requirements apply only to members of fire brigades performing interior structural fire fighting.

The requirements of this section do not apply to airport crash rescue or forest fire fighting operations. (a)(2)

(b) Organization.

Organizational statement. (b)(1)

Has a statement or written policy been prepared which establishes the existence of a fire brigade? (b)(1)

Does the statement or written policy establish the following:

- the basic organizational structure; (b)(1)
- the type, amount, and frequency of training to be provided to fire brigade members; (b)(1)
- the expected number of members in the fire brigade; and (b)(1)
- the functions that the fire brigade is to perform at the workplace? (b)(1)

Is the organizational statement available for inspection by the Assistant Secretary and by employees or their designated representatives? (b)(1)

Personnel (b)(2)

Are employees who are expected to do interior structural fire fighting physically capable of performing duties which may be assigned to them during emergencies? (b)(2)

Are employees with known heart disease, epilepsy, or emphysema not permitted to participate in fire brigade emergency activities unless a physician's certificate of the employees' fitness to participate in such activities is provided? (b)(2)

(c) Training and education. (c)(1)

Are training and education provided for all fire brigade members commensurate with those duties and functions that fire brigade members are expected to perform? (c)(1)

Is such training and education provided to fire brigade members before they perform fire brigade emergency activies? (c)(1)

1910.156 — FIRE BRIGADES

YES NO

Are fire brigade leaders and training instructors provided with training and education which is more comprehensive than that provided to the general membership of the fire brigade? (c)(1)

Is training and education conducted frequently enough to assure that each member of the fire brigade is able to perform the member's assigned duties and functions satisfactorily and in a safe manner so as not to endanger fire brigade members or other employees? (c)(2)

Are all fire brigade members provided with training at least annually? (c)(2)

Are fire brigade members who are expected to perform interior structural fire fighting provided with an education session or training at least quarterly? (c)(2)

Is the quality of the training and education program for fire brigade members similar to those conducted by such fire training schools as the Maryland Fire and Rescue Institute; Iowa Fire Service Extension; West Virginia Fire Service Extension; Georgia Fire Academy, New York State Department of Fire Prevention and Control; Louisiana State University Fireman Training Program, or Washington State's Fire Service Training Commission for Vocational Education?

Example: For the oil refinery industry, with its unique hazards, the training and education program for those fire brigade members shall be similar to those conducted by Texas A & M University, Lamar University, Reno Fire School, or the Delaware State Fire School. (c)(3)

Are fire brigade members informed about special hazards such as storage and use of flammable liquids and gases, toxic chemicals, radioactive sources, and water reactive substances, to which they may be exposed during fire and other emergencies? (c)(4)

Are fire brigade members advised of any changes that occur in relation to the special hazards? (c)(4)

Are written procedures developed that describe the actions to be taken in situations involving the special hazards? (c)(4)

Are the procedures available for inspection by fire brigade members? (c)(4)

Are the procedures included in the training and education program? (c)(4)

(d) Fire fighting equipment. (d)(1)

Is fire fighting equipment maintained and inspected at least annually to assure the safe operational condition of the equipment? (d)(1)

Are portable fire extinguishers and respirators inspected at least monthly? (d)(1)

Is fire fighting equipment that is in damaged or unserviceable condition removed from service and replaced? (d)(1)

(e) Protective clothing. (e)(1)

The following requirements apply to those employees who perform interior structural fire fighting. The requirements do not apply to employees who use fire extinguishers or standpipe systems to control or extinguish fires only in the incipient stage.

YES NO

General. (e)(1)

Is protective clothing which complies with the requirements of this paragraph provided at no cost to the employee? (e)(1)(i)

Is the protective clothing used? (e)(1)(i)

Does protective clothing ordered or purchased after July 1, 1981 meet the requirements contained in this paragraph? (e)(1)(i)

As the new equipment is provided, do all fire brigade members wear the equipment when performing interior structural fire fighting? (e)(1)(i)

After July 1, 1985, do all fire brigade members wear protective clothing meeting the requirements of this paragraph when performing interior structural fire fighting? (e)(1)(i)

Does protective clothing protect the head, body, and extremities? (e)(1)(ii)

Does protective clothing consist of at least the following components:

foot and leg protection;

hand protection;

body protection;

eye, face and head protection? (e)(1)(ii)

Foot and leg protection. (e)(2)

Does foot and leg protection meet the requirements of paragraphs (e)(2)(ii) and (e)(2)(iii) of this section which may be achieved by either of the following methods:

(a) Fully extended boots which provide protection for the legs; or

(b) Protective shoes or boots worn in combination with protective trousers that meet the requirements of paragraph (e)(3) of this section? (e)(2)(i)

Does protective footwear meet the requirements of 1910.136 for Class 75 footwear? (e)(2)(ii)

Is protective footwear equipped with slip-resistant outer soles? (e)(2)(ii)

Is protective footwear water-resistant for at least 5 inches (12.7 cm) above the bottom of the heel? (e)(2)(ii)

Is protective footwear tested in accordance with paragraph (1) of Appendix E? (e)(2)(iii)

Does protective footwear provide protection against penetration of the midsole by a size 8D common nail when at least 300 pounds (1330 N) of static force is applied to the nail? (e)(2)(iii)

Body protection. (e)(3)

Is body protection coordinated with foot and leg protection to ensure full body protection for the wearer? (e)(3)(i)

Is full body protection for the wearer achieved by one of the following methods:

(a) Wearing of a fire-resistive coat meeting the requirements of paragraphs (e)(3)(ii) of this section in combination with fully extended boots meeting the requirements of paragraphs (e)(2)(ii) and (e)(2)(iii) of this section; or

YES NO

(b) Wearing of a fire-resistive coat in combination with protective trousers both of which meet the requirements of paragraph (e)(3)(ii) of this section? (e)(3)(i)

Is the performance, construction, and testing of fire-resistive coats and protective trousers at least equivalent to the requirements of the National Fire Protection Association (NFPA No. 1971-1975), "Protective Clothing for Structural Fire Fighting"?

The following are permissible variations from those requirements:

(a) Tearing strength of the outer shell shall be a minimum of 8 pounds (35.6 N) in any direction when tested in accordance with paragraph (2) of Appendix E; and

(b) The outer shell may discolor but shall not separate or melt when placed in a forced air laboratory oven at a temperature of 500°F (260°C) for a period of five minutes. After cooling to ambient temperature and using the test method specified in paragraph (3) of Appendix E, char length shall not exceed 4.0 inches (10.2 cm) and after-flame shall not exceed 2.0 seconds. (e)(3)(ii)

Hand protection. (e)(4)

Does hand protection consist of protective gloves or glove system which will provide protection against cut, puncture, and heat penetration? (e)(4)(i)

Are gloves or glove system tested in accordance with the test methods contained in the National Institute for Occupational Safety and Health (NIOSH) 1976 publication, "The Development of Criteria for Fire Fighter's Gloves; Vol. 11, Part 11: Test Methods"? (e)(4)(i)

Do gloves or glove system meet the following criteria for cut, puncture, and heat penetration:

(A) Do materials used for gloves resist surface cut by a blade with an edge having a 60° included angle and a .001 in (.0025 cm.) radius, under an applied force of 16 1bf (72N), and at a slicing velocity of greater or equal to 60 in/min (2.5 cm/sec)? (e)(4)(i)(A)

(B) Do materials used for the palm and palm side of the fingers resist puncture by a penetrometer (simulating a 4d lath nail), under an applied force of 13.2 1bf (60N), and at a velocity greater or equal to 20 in/min (.85 cm./sec)? (e)(4)(i)(B)

(C) Does the temperature inside the palm and gripping surface of the fingers of gloves not exceed 135°F (57°C) when gloves or glove system are exposed to 932°F (500°C) for five seconds at 4 psi (28 kPa) pressure? (e)(4)(i)(C)

Are exterior materials of gloves flame resistant? (e)(4)(ii)

Are exterior materials of gloves tested in accordance with paragraph (3) of Appendix E? (e)(4)(ii)

Is the maximum after flame 2.0 seconds and the maximum char length 4.0 inches (10.2 cm)? (e)(4)(ii)

YES NO

When design of the fire-resistive coat does not otherwise provide protection for the wrists, do protective gloves have wristlets of at least 4.0 inches (1 0.2 cm) in length to protect the wrist area when the arms are extended upward and outward from the body? **(e)(4)(iii)**

Head, eye and face protection. **(e)(5)**

Does head protection consist of a protective head device with ear flaps and chin strap which meet the performance, construction, and testing requirements of the National Fire Safety and Research Office of the National Fire Prevention and Control Administration, U.S. Department of Commerce (now known as the U.S. Fire Administration), which are contained in "Model Performance Criteria for Structural Firefighter's Helmets"? **(e)(5)(i)**

Are protective eye and face devices which comply with 1910.133 used by fire brigade members when performing operations where the hazards of flying or falling materials which may cause eye and face injuries are present? **(e)(5)(ii)**

Do protective eye and face devices provided as accessories to protective head devices (face shields) meet the requirements of 1910.133? **(e)(5)(ii)**

Do full face pieces, helmets, or hoods of breathing apparatus meat the requirements of 1910.134 and paragraph (f) of this section? **(e)(5)(iii)**

(f) Respiratory protection devices.

General requirements. **(f)(1)**

Are respirators provided, at no cost to the employee, which comply with the requirements of this paragraph? **(f)(1)(i)**

Are respirators used? **(f)(1)(i)**

Do respiratory protective devices worn by fire brigade members meet the requirements contained in 1910.134 and the requirements contained in this paragraph? **(f)(1)(i)**

Are respiratory protective devices certified under 30 CFR part 11? **(f)(1)(i)**

Is approved self-contained breathing apparatus with full face piece, or with approved helmet or hood configuration, provided to and worn by fire brigade members while working inside buildings or confined spaces where toxic products of combustion or an oxygen deficiency may be present? **(f)(1)(ii)**

Is such apparatus worn during emergency situations involving toxic substances? **(f)(1)(ii)**

Is approved self-contained breathing apparatus equipped with either a "buddy-breathing" device or a quick disconnect valve? **(f)(1)(iii)**

If these accessories are used, do they not cause damage to the apparatus, or restrict the air flow of the apparatus, or obstruct the normal operation of the apparatus? **(f)(1)(iii)**

If approved self-contained compressed air breathing apparatus is used with approved cylinders from other approved self-contained compressed air breathing apparatus, are such cylinders of the same capacity and pressure rating? **(f)(1)(iv)**

Do all compressed air cylinders used with self-contained breathing apparatus meet DOT and NIOSH criteria? **(f)(1)(iv)**

Except for escape self-contained breathing apparatus (ESCBA) used only for emergency escape purposes, does self-contained breathing apparatus have a minimum service life rating of 30 minutes in accordance with the methods and requirements of the Mine Safety and Health Administration (MSHA) and NIOSH? **(f)(1)(v)**

YES NO

Is self-contained breathing apparatus provided with an indicator which automatically sounds an audible alarm when the remaining service life of the apparatus is reduced to within a range of 20 to 25 percent of its rated service time? **(f)(1)(vi)**

Positive-pressure breathing apparatus. **(f)(2)**

Are self-contained breathing apparatus ordered or purchased after July 1, 1981, for use by fire brigade members performing interior structural fire fighting operations, of the pressure-demand or other positive-pressure type? **(f)(2)(i)**

Effective July 1, 1983, are only pressure-demand or other positive-pressure self-contained breathing apparatus worn by fire brigade members performing interior structural fire fighting? **(f)(2)(i)**

Are self-contained breathing apparatus in the positive pressure mode when fire brigade members are performing interior structural fire fighting operations? **(f)(2)(ii)**

Are negative-pressure self-contained breathing apparatus with a rated service life of mare than 2 hours and which have a minimum protection factor of 5,000, as determined by an acceptable quantitative fit test performed on each individual, used only during those interior structural fire fighting situations for which it is demonstrated that long duration breathing apparatus is necessary? **(f)(2)(iii)**

Are quantitative fit test procedures available for inspection by the Assistant Secretary or authorized representative? **(f)(2)(iii)**

Such negative-pressure breathing apparatus will continue to be acceptable for 18 months after a positive-pressure breathing apparatus with the same or longer rated service life is certified by NIOSH. After this 18-month period, all self-contained breathing apparatus used for these long duration situations shall be of the positive-pressure type. **(f)(2)(iii)**

1910.157 — PORTABLE FIRE EXTINGUISHERS

(a) Scope and application.

The requirements of this section apply to the placement, use, maintenance, and testing of portable fire extinguishers provided for the use of employees. Paragraph (d) of this section does not apply to extinguishers provided for employee use on the outside of workplace buildings or structures.

Where extinguishers are provided but are not intended for employee use and the employer has an emergency action plan and a fire prevention plan which meet the requirements of 1910.38, then only the requirements of paragraphs (e) and (f) of this section apply. **(a)**

(b) Exemptions.

Where the employer has established and implemented a written fire safety policy which requires the immediate and total evacuation of employees from the workplace upon the sounding of a fire alarm signal and which includes an emergency action plan and a fire prevention plan which meet the requirements of 1910.38, and when extinguishers are not available in the workplace, the employer is exempt from all requirements of this section unless a specific standard in Part 1910 requires that a portable fire extinguisher be provided. **(b)(1)**

	YES	NO
Where the employer has an emergency action plan meeting the requirements of 1910.38 which designates certain employees to be the only employees authorized to use the available portable fire extinguishers, and which requires all other employees in the fire area to immediately evacuate the affected work area upon the sounding of the fire alarm, the employer is exempt from the distribution requirements in paragraph (d) of this section. **(b)(2)**		
(c) General requirements.		
Are portable fire extinguishers provided, mounted, located and identified so that they are readily accessible to employees without subjecting the employees to possible injury? **(c)(1)**		
Are only approved portable fire extinguishers in use? **(c)(2)**		
Are no portable fire extinguishers using tetrachloride or chlorobromomethane extinguishing agents provided or made available in the workplace? **(c)(3)**		
Are portable fire extinguishers maintained in a fully charged and operable condition? **(c)(4)**		
Are portable fire extinguishers kept in their designated places at all times except during use? **(c)(4)**		
Have arrangements been made to permanently remove from service by January 1, 1982, all soldered or riveted shell self-generating soda acid or self-generating foam or gas cartridge water type portable fire extinguishers which are operated by inverting the extinguisher to rupture the cartridge or to initiate an uncontrollable pressure generating chemical reaction to expel the agent? **(c)(5)**		
(d) Selection and distribution.		
Are portable fire extinguishers provided for employee use and selected and distributed based on the classes of anticipated workplace fires and on the size and degree of hazard which would affect their use? **(d)(1)**		
Are portable fire extinguishers distributed for use by employees on Class A fires so that the travel distance for employees to any extinguisher is 75 feet (22.9 m) or less? **(d)(2)**		
Do uniformly spaced standpipe systems or hose stations connected to a sprinkler system installed for emergency use by employees instead of Class A portable fire extinguishers provide total coverage of the area to be protected? **(d)(3)**		
Are employees trained at least annually in the use of such systems? **(d)(3)**		
Are portable fire extinguishers distributed for use by employees on Class B fires so that the travel distance from the Class B hazard area to any extinguisher is 50 feet (15.2 m) or less? **(d)(4)**		
Are portable fire extinguishers used for Class C hazards distributed on the basis of the appropriate pattern for the existing Class A or Class B hazards? **(d)(5)**		

	YES	NO
Are portable fire extinguishers or other containers of Class D extinguishing agent for use by employees so distributed that the travel distance from the combustible metal working area to any extinguishing agent is 75 feet (22.9 m) or less? **(d)(6)**		
Are portable fire extinguishers for Class D hazards provided as required in those combustible metal working areas where combustible metal powders, flakes, shavings, or similarly sized products are generated at least once every two weeks? **(d)(6)**		
(e) Inspection, maintenance and testing.		
Are all portable fire extinguishers in the workplace inspected, maintained, and tested? **(e)(1)**		
Are portable extinguishers or hose used in lieu thereof under paragraph (d)(3) of this section visually inspected monthly? **(e)(2)**		
Are portable fire extinguishers subjected to an annual maintenance check? **(e)(3)**		
Is the annual maintenance date recorded and retained for one year after the last entry or the life of the shell, whichever is less? **(e)(3)**		
Is the annual maintenance date available to the Assistant Secretary upon request? **(e)(3)**		
Are stored pressure dry chemical extinguishers that require a 12-year hydrostatic test emptied and subjected to applicable maintenance procedures every 6 years? **(e)(4)**		
NOTE: Dry chemical extinguishers having nonrefillable disposable containers are exempt from this requirement. **(e)(4)**		
When recharging or hydrostatic testing is performed, the 6-year requirement begins from that date. **(e)(4)**		
Is alternate equivalent protection provided when portable fire extinguishers are removed from service for maintenance and recharging? **(e)(5)**		
(f) Hydrostatic testing.		
Is hydrostatic testing performed by trained persons with suitable testing equipment and facilities? **(f)(1)**		
Are portable extinguishers hydrostatically tested at the intervals listed in Table L-1 of this section, except under any of the following conditions:		
When the unit has been repaired by soldering, welding, brazing, or use of patching compounds; **(f)(2)(i)**		
When the cylinder or shell threads are damaged; **(f)(2)(ii)**		
When there is corrosion that has caused pitting, including corrosion under removable name plate assemblies; **(f)(2)(iii)**		
When the extinguisher has been burned in a fire; **(f)(2)(iv)**		
When a calcium chloride extinguishing agent has been used in a stainless stool shell. **(f)(2)(v)**		

YES NO

Table L-1

Type of extinguishers	Test interval (years)
Soda acid (soldered brass shells) (until 1/1/82)	([1])
Soda acid (stainless steel shell)	5
Cartridge operated water and/or antifreeze	5
Stored pressure water and/or antifreeze	5
Wetting agent	5
Foam (soldered brass shells) (until 1/1/82)	([1])
Foam (stainless steel shell)	5
Aqueous Film Forming foam (AFFF)	5
Loaded stream	5
Dry chemical with stainless steel	5
Carbon dioxide	5
Dry chemical, stored pressure, with mild steel, brazed brass or aluminum shells	12
Dry chemical, cartridge or cylinder operated, with mild steel shells	12
Halon 1211	12
Halon 1301	12
Dry powder, cartridge or cylinder operated with mild steel shells	12

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[1] Extinguishers having shells constructed of copper or brass joined by soft solder or rivets shall not be hydrostatically tested and shall be removed from service by January 1, 1982. (Not permitted)

In addition to an external visual examination, is an internal examination of cylinders and shells to be tested made prior to the hydrostatic tests? **(f)(3)**

Are portable fire extinguishers hydrostatically tested whenever they show new evidence of corrosion or mechanical injury, except under the conditions listed in paragraph (f)(2)(i)-(v) of this section? **(f)(4)**

Are hydrostatic tests performed on extinguisher hose assemblies which are equipped with a shut-off nozzle at the discharge end of the hose? **(f)(5)**

Is the test interval the same as specified for the extinguisher an which the hose is installed? **(f)(5)**

Are carbon dioxide hose assemblies with a shut-off nozzle hydrostatically tested at 1,250 psi (8,620 kPa)? **(f)(6)**

Are dry chemical and dry powder hose assemblies with a shut-off nozzle hydrostatically tested at 300 psi (2,070 kPa)? **(f)(7)**

Are hose assemblies that do not pass a hydrostatic test recorded or stamped? **(f)(8)**

Are hose assemblies for carbon dioxide extinguishers that require a hydrostatic test tested within a protective cage device? **(f)(9)**

Are carbon dioxide extinguishers and nitrogen or carbon dioxide cylinders used with wheeled extinguishers tested every 5 years at 5/3 of the service pressure as stamped into the cylinder? **(f)(10)**

Are nitrogen cylinders which comply with 49 CFR 173.34(e)(15) hydrostatically tested every 10 years? **(f)(10)**

YES NO

Are all stored pressure and Halon 1211 types of extinguishers hydrostatically tested at the factory test pressure not to exceed two times the service pressure? **(f)(11)**

Are acceptable self-generating type soda acid and foam extinguishers tested at 350 psi (2,41 0 kPa)? **(f)(12)**

Is hydrostatic testing done with means other than prohibited air or gas pressure? **(f)(13)**

Are extinguisher shells, cylinders, or cartridges which fail a hydrostatic pressure test, or which are not fit for testing, removed from service and from the workplace? **(f)(14)**

Is the equipment for testing compressed gas type cylinders of the water jacket type? **(f)(15)(i)**

Is the equipment provided with an expansion indicator which operates with an accuracy within one percent of the total expansion or .1cc (.1 mL) of liquid? **(f)(15)(i)**

Does the equipment for testing noncompressed gas type cylinders have a hydrostatic test pump, hand or power operated, capable of producing not less than 150 percent of the test pressure, which shall include appropriate check valves and fittings? **(f)(15)(ii)(a)**

Does the equipment have a flexible connection for attachment to fittings to test through the extinguisher nozzle, test bonnet, or hose outlet, as is applicable? **(f)(15)(ii)(b)**

Does the equipment include a protective cage or barrier for personal protection of the tester, designed to provide visual observation of the extinguisher under test? **(f)(15)(ii)(c)**

Is evidence that the required hydrostatic testing of fire extinguishers has been performed at the time intervals shown in Table L-1 maintained? **(f)(16)**

Can the evidence of testing be provided to the Assistant Secretary upon request? **(f)(16)**

Is such evidence in the form of a certification record which includes the date of test, the signature of the person who performed the test, and the serial number, or other identifier, of the fire extinguisher that was tested? [**Revised 1986**] **(f)(16)**

Are such records kept until the extinguisher is hydrostatically retested at the time interval specified in Table L-1 or until the extinguisher is taken out of service, whichever comes first? **(f)(16)**

(g) Training and education.

Where portable fire extinguishers are provided for employee use in the workplace, is an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting also provided? **(g)(1)**

Is the education required in paragraph (g)(1) of this section provided upon initial employment and at least annually thereafter? **(g)(2)**

Have employees who have been designated to use fire fighting equipment as part of an emergency action plan been trained in the use of the appropriate equipment? **(g)(3)**

Is the training required in paragraph (g)(3) of this section provided upon initial assignment to the designated group of employees and at least annually thereafter? **(g)(4)**

1910.158 — STANDPIPE AND HOSE SYSTEMS

YES NO

(a) Scope and application.

Scope. **(a)(1)**

This section applies to all small hose, Class II, and Class III standpipe systems installed to meet the requirements of a particular OSHA standard. **(a)(1)**

Exception. **(a)(2)**

This section does not apply to Class I standpipe systems. **(a)(2)**

(b) Protection of standpipes.

Are standpipes located or otherwise protected against mechanical damage? **(b)(1)**

Are damaged standpipes repaired promptly? **(b)(1)**

(c) Equipment.

Reels and cabinets. **(c)(1)**

Where reels or cabinets are provided to contain fire hose, are they designed to facilitate prompt use of the hose valves, the hose, and other equipment at the time of a fire or other emergency? **(c)(1)**

Are the reels and cabinets conspicuously identified and used only for fire equipment? **(c)(1)**

Hose outlets and connections. **(c)(2)**

Are hose outlets and connections located high enough above the floor to avoid being obstructed and to be accessible to employees? **(c)(2)(i)**

Are screw threads standardized or appropriate adapters provided throughout the system? **(c)(2)(ii)**

Are hose connections compatible with those used on the supporting fire equipment? **(c)(2)(ii)**

Hose. **(c)(3)**

Is every 1½" (3.8 cm) or smaller hose outlet used to meet this standard equipped with hose connected and ready for use? **(c)(3)(i)**

In extremely cold climates where such installation may result in damaged equipment, the hose may be stored in another location provided it is readily available and can be connected when needed. **(c)(3)(i)**

Are standpipe systems installed after January 1, 1981, for use by employees, equipped with lined hose? **(c)(3)(ii)**

Unlined hose may remain in use on existing systems. However, after the effective date of this standard, unlined hose which becomes unserviceable shall be replaced with lined hose. **(c)(3)(ii)**

Beginning January 1, 1981, is the hose of such length that friction loss resulting from water flowing through the hose will not decrease the pressure at the nozzle below 30 psi (210 kPa)? **(c)(3)(iii)**

Is the dynamic pressure at the nozzle within the range of 30 psi (210 kPa) to 125 psi (860 kPa)? **(c)(3)(iii)**

Nozzles. **(c)(4)**

Beginning July 1, 1981, is standpipe hose equipped with shut-off type nozzles? **(c)(4)**

1910.158 — STANDPIPE AND HOSE SYSTEMS

YES NO

(d) Water supply.

Is the minimum water supply for standpipe and hose systems, which are provided for the use of employees, sufficient to provide 100 gallons per minute (6.3 1/s) for a period of at least thirty minutes? **(d)**

(e) Tests and maintenance.

Acceptance tests. **(e)(1)**

Is the piping of Class 11 and Class III systems installed after January 1, 1981, including yard piping, hydrostatically tested for a period of at least 2 hours at not less than 200 psi (1380 kPa), or at least 50 psi (340 kPa) in excess of normal pressure when such pressure is greater than 150 psi (1030 kPa)? **(e)(1)(i)**

Is hose on all standpipe systems installed after January 1, 1981, hydrostatically tested with couplings in place, at a pressure of not less than 200 psi (1380 kPa), before it is placed in service? **(e)(1)(ii)**

Is this pressure maintained for at least 15 seconds and not more than one minute during which time the hose shall not leak nor shall any jacket thread break during the test? **(e)(1)(ii)**

Maintenance. **(e)(2)**

Are water supply tanks kept filled to the proper level except during repairs? **(e)(2)(i)**

When pressure tanks are used, is proper pressure maintained at all times except during repairs? **(e)(2)(i)**

Are valves in the main piping connections to the automatic sources of water supply kept fully open at all times except during repair? **(e)(2)(ii)**

Are hose systems inspected at least annually and after each use to assure that all of the equipment and hose are in place, available for use, and in serviceable condition? **(e)(2)(iii)**

When the system or any portion thereof is found not to be serviceable, is it removed from service immediately and replaced with equivalent protection such as extinguishers and fire watches? **(e)(2)(iv)**

Is hemp or linen hose on existing systems unracked, physically inspected for deterioration, and reracked using a different fold pattern at least annually? **(e)(2)(v)**

Is defective hose replaced in accordance with paragraph (c)(3)(ii)? **(e)(2)(v)**

Are trained persons designated to conduct all inspections required under this section? **(e)(2)(vi)**

1910.159 — AUTOMATIC SPRINKLER SYSTEMS

The requirements of this section apply to all automatic sprinkler systems installed to meet a particular OSHA standard. **(a)(1)**

For automatic sprinkler systems used to meet OSHA requirements and installed prior to the effective date of this standard, compliance with the National Fire Protection Association (NFPA) or the National Board of Fire Underwriters (NBFU) standard in effect at the time of the system's installation will be acceptable as compliance with this section. **(a)(2)**

1910.159 — AUTOMATIC SPRINKLER SYSTEMS

	YES	NO
(b) Exemptions. Automatic sprinkler systems installed in workplaces, but not required by OSHA, are exempt from the requirements of this section. (b)		
(c) General requirements *Design.* (c)(1) Do all automatic sprinkler designs used to comply with this standard provide the necessary discharge patterns, densities, and water flow characteristics for complete coverage in a particular workplace or zoned subdivision of the workplace? (c)(1)(i)		
Are only approved equipment and devices used in the design and installation of automatic sprinkler systems used to comply with this standard? (c)(1)(ii)		
Maintenance. (c)(2) Is the automatic sprinkler system installed to comply with this section properly maintained? (c)(2)		
Is a main drain flow test performed on each system annually? (c)(2)		
Is the inspectors test valve opened at least every two years to assure that the sprinkler system operates properly? (c)(2)		
Acceptance tests. (c)(3) Are proper acceptance tests on sprinkler systems installed for employee protection after January 1, 1981, conducted? (c)(3)		
Are dates of such tests recorded? (c)(3)		
Do the acceptance tests include the following: flushing of underground connections; (c)(3)(i)		
hydrostatic tests of piping in system; (c)(3)(ii)		
air tests in dry-pipe systems; (c)(3)(iii)		
dry-pipe valve operation; and (c)(3)(iv)		
test of drainage facilities? (c)(3)(v)		
Water supplies. (c)(4) Is every automatic sprinkler system provided with at least one automatic water supply capable of providing design water flow for at least 30 minutes? (c)(4)		
Is an auxiliary water supply or equivalent protection provided when the automatic water supply is out of service, except for systems of 20 or fewer sprinklers? (c)(4)		
Hose connections for fire fighting use. (c)(5) If hose connections for fire fighting use are attached to wet pipe sprinkler systems, does the water supply satisfy the combined design demand for sprinklers and standpipes? (c)(5)		
Protection of piping. Is automatic sprinkler system piping protected against freezing and exterior surface corrosion? (c)(6)		
Drainage. (c)(7) Are all dry sprinkler pipes and fittings installed so that the system may be totally drained? (c)(7)		
Sprinklers. Are only approved sprinklers used on systems? (c)(8)(i)		

1910.159 — AUTOMATIC SPRINKLER SYSTEMS

	YES	NO
If older style sprinklers are used to replace standard sprinklers, is a complete engineering review of the altered part of the system made? (c)(8)(ii)		
Are sprinklers protected from mechanical damage? (c)(8)(iii)		
Sprinkler alarms. (c)(9) On all sprinkler systems having more than twenty (20) sprinklers, is a local water flow alarm provided which sounds an audible signal on the premises upon water flow through the system equal to the flow from a single sprinkler? (c)(9)		
Sprinkler spacing. (c)(10) Are sprinklers spaced to provide a maximum protection area per sprinkler, a minimum of interference to the discharge pattern by building or structural members or building contents and suitable sensitivity to possible fire hazards? (c)(10)		
Is the minimum vertical clearance between sprinklers and material below 18 in (45.7 cm)? (c)(10)		
Hydraulically designed systems. (c)(11) Are hydraulically designed automatic sprinkler systems or portions thereof identified? (c)(11)		
Is the location, number of sprinklers in the hydraulically designed section, and the basis of the design indicated? (c)(11)		
If central records are used in lieu of signs at sprinkler valves, are the records available for inspection and copying by the Assistant Secretary? (c)(11)		

1910.160 — FIXED EXTINGUISHING SYSTEMS, GENERAL

	YES	NO
(a) Scope and application. This section applies to all fixed extinguishing systems installed to meet a particular OSHA standard except for automatic sprinkler systems which are covered by 1910.159. (a)(1)		
This section also applies to fixed systems not installed to meet a particular OSHA standard, but which, by means of their operation, may expose employees to possible injury, death, or adverse health consequences caused by the extinguishing agent. Such systems are only subject to the requirements of paragraphs (b)(4) through (b)(7) and (c) of this section. (a)(2)		
Systems otherwise covered in paragraph (a)(2) of this section which are installed in areas with no employee exposure are exempted from the requirements of this section. (a)(3)		
(b) General requirements. Are fixed extinguishing system components and agents designed and approved for use on the specific fire hazards they are expected to control or extinguish? (b)(1)		
If for any reason a fixed extinguishing system becomes inoperable, are employees notified? (b)(2)		
Are necessary temporary precautions taken to assure the safety of employees until the system is restored to operating order? (b)(2)		
Are any defects or impairments properly corrected by trained personnel? (b)(2)		

1910.160 — FIXED EXTINGUISHING SYSTEMS, GENERAL

	YES	NO
Is a distinctive alarm or signaling system provided which complies with 1910.165 and is capable of being perceived above ambient noise or light levels, on all extinguishing systems in those portions of the workplace covered by the extinguishing system to indicate when the extinguishing system is discharging? (b)(3)		
Discharge alarms are not required on systems where discharge is immediately recognizable. (b)(3)		
Are effective safeguards provided to warn employees against entry into discharge areas where the atmosphere remains hazardous to employee safety or health? (b)(4)		
Are hazard warning or caution signs posted at the entrance to, and inside of, areas protected by fixed extinguishing systems which use agents in concentrations known to be hazardous to employee safety and health? (b)(5)		
Are fixed systems inspected annually by a person knowledgeable in the design and function of the system to assure that the system is maintained in good operating condition? (b)(6)		
Is the weight and pressure of refillable containers checked at least semi-annually? (b)(7)		
If the container shows a loss in net content or weight of more than 5 percent, or a loss in pressure of more than 10 percent, is it subjected to maintenance? (b)(7)		
Are factory charged nonrefillable containers which have no means of pressure indication weighed at least semiannually? (b)(8)		
If a container shows a loss in net weight of more than 5 percent, is it replaced? (b)(8)		
Are inspection and maintenance dates recorded on the container, on a tag attached to the container, or in a central location? (b)(9)		
Is a record of the last semi-annual check maintained until the container is checked again or for the life of the container, whichever is less? (b)(9)		
Are trained employees designated to inspect, maintain, operate, or repair fixed extinguishing systems? (b)(10)		
Is the employees' training reviewed annually to keep them up-to-date in the functions they are to perform? (b)(10)		
Is the use of chlorobromomethane or carbon tetrachloride as an extinguishing agent prohibited where employees may be exposed? (b)(11)		
Are systems installed in the presence of corrosive atmospheres constructed on noncorrosive material or otherwise protected against corrosion? (b)(12)		
Is automatic detection equipment approved, installed, and maintained in accordance with 1910.164? (b)(13)		
Do all systems designed for and installed in areas with climatic extremes operate effectively at the expected extreme temperatures? (b)(14)		
Is at least one manual station provided for discharge activation of each fixed extinguishing system? (b)(15)		
Are manual operating devices identified as to the hazard against which they will provide protection? (b)(16)		

1910.160 — FIXED EXTINGUISHING SYSTEMS, GENERAL

	YES	NO
Is personal protective equipment needed for immediate rescue of employees trapped in hazardous atmospheres created by an agent discharge provided and used? (b)(17)		
(c) Total flooding systems with potential health and safety hazards to employees.		
Is an emergency action plan provided in accordance with 1910.38 for each area within a workplace that is protected by a total flooding system which provides agent concentrations exceeding the maximum safe levels set forth in paragraphs (b)(5) and (b)(6) of 1910.162? (c)(1)		
Systems installed in areas where employees cannot enter during or after the system's operations are exempt from the requirements of paragraph (c) of this section. (c)(2)		
Is a pre-discharge employee alarm which complies with 1910.165 provided on all total flooding systems? (c)(3)		
Is the alarm capable of being perceived above ambient light or noise levels before the system discharges, which will give employees time to safely exit from the discharge area prior to system discharge? (c)(3)		
Is automatic actuation of total flooding systems by means of an approved fire detection device installed and interconnected with a pre-discharge employee alarm system to give employees time to safely exit from the discharge area prior to system discharge provided? (c)(4)		

1910.161 — FIXED EXTINGUISHING SYSTEMS, DRY CHEMICAL

	YES	NO
(a) Scope and application.		
This section applies to all fixed extinguishing systems, using dry chemical as the extinguishing agent, installed to meet a particular OSHA standard. These systems shall also comply with 1910.160. (a)		
(b) Specific requirements.		
Are dry chemical agents compatible with any foams or wetting agents with which they are used? (b)(1)		
Are dry chemical extinguishing agents of different compositions prohibited? (b)(2)		
Are dry chemical systems refilled with the chemical stated on the approval nameplate or an equivalent compatible material? (b)(2)		
When dry chemical discharge may obscure vision, is a pre-discharge employee alarm provided which complies with 1910.165 and which will give employees time to safely exit from the discharge area prior to system discharge? (b)(3)		
Is the dry chemical supply of all but stored pressure systems sampled at least annually to assure that the dry chemical supply is free of moisture which may cause the supply to cake or form lumps? (b)(4)		
Is the rate of application of dry chemicals such that the designed concentration of the system will be reached within 30 seconds of initial discharge? (b)(5)		

1910.162 — FIXED EXTINGUISHING SYSTEMS, GASEOUS AGENT

YES NO

(a) Scope and application.

Scope. (a)(1)

This section applies to all fixed extinguishing systems, using a gas as the extinguishing agent, installed to meet a particular OSHA standard. These systems shall also comply with 1910.160. In some cases, the gas may be in a liquid state during storage. (a)(1)

Application. (a)(2)

The requirements of paragraphs (b)(2) and (b)(4) through (b)(6) shall apply only to total flooding systems. (a)(2)

(b) Specific requirements.

Are agents used for initial supply and replenishment of the type approved for the system's application? (b)(1)

If carbon dioxide is obtained by dry ice conversion to liquid, is it processed to remove excess water and oil? (b)(1)

Except during overhaul, is the designed concentration to gaseous agents maintained until the fire has been extinguished or is under control? (b)(2)

Are employees not exposed to toxic levels of gaseous agent or its decomposition products? (b)(3)

Is the designed extinguishing concentration reached within 30 seconds of initial discharge except for Halon systems which must achieve design concentration within 10 seconds? (b)(4)

Is a distinctive pro-discharge employee alarm provided capable of being perceived above ambient light or noise levels when agent design concentrations exceed the maximum safe level for employee exposure? (b)(5)

Is a pre-discharge employee alarm for alerting employees before system discharge provided on Halon 1211 and carbon dioxide systems with a design concentration of 4 percent or greater and for Halon 1301 systems with a design concentration of 10 percent or greater? (b)(5)

Does the pre-discharge employee alarm provide employees time to safely exit the discharge area prior to system discharge? (b)(5)

Is Halon 1301 in concentrations greater than 7 percent not used where egress from an area cannot be accomplished within one minute? (b)(6)(i)

Is Halon 1301 in a concentration greater than 10 percent not used where egress takes greater than 30 seconds but less than one minute? (b)(6)(ii)

If Halon 1301 concentrations greater than 10 percent are used in areas not normally occupied by employees, can any employee in the area escape within 30 seconds? (b)(6)(iii)

Are no unprotected employees allowed to enter the area during agent discharge? (b)(6)(iii)

1910.163 — FIXED EXTINGUISHING SYSTEMS, WATER SPRAY AND FOAM

(a) Scope and application.

This section applies to all fixed extinguishing systems, using water or foam solution as the extinguishing agent, installed to meet a particular OSHA standard. These systems shall also comply with 1910.160. This section does not apply to automatic sprinkler systems which are covered under 1910.159. (a)

YES NO

(b) Specific requirements.

Are foam and water spray systems designed to be effective in at least controlling fire in the protected area or an protected equipment? (b)(1)

Is drainage of water spray systems directed away from areas where employees are working? (b)(2)

Is no emergency egress permitted through the drainage path? (b)(2)

1910.164 — FIRE DETECTION SYSTEMS

(a) Scope and application.

This section applies to all automatic fire detection systems installed to meet the requirements of a particular OSHA standard. (a)

(b) Installation and restoration.

Are all devices and equipment constructed and installed to comply with this standard approved for the purpose for which they are intended? (b)(1)

Are all fire detection systems and components restored to normal operating condition as promptly as possible after each test or alarm? (b)(2)

Are spare detection devices and components which are normally destroyed in the process of detecting fires available on the premises or from a local supplier in sufficient quantities and locations for prompt restoration of the system? (b)(2)

(c) Maintenance and testing.

Are all systems maintained in an operable condition except during repairs or maintenance? (c)(1)

Are fire detectors and fire detection systems tested and adjusted as often as needed to maintain proper reliability and operating condition? (c)(2)

Are pneumatic and hydraulic operated detection systems installed after January 1, 1981, equipped with supervised systems? (c)(3)

Are the servicing, maintenance and testing of fire detection systems, including cleaning and necessary sensitivity adjustments, performed by a trained person knowledgeable in the operations and functions of the system? (c)(4)

Are fire detectors that need to be cleaned of dirt, dust, or other particulates in order to be fully operational cleaned at regular periodic intervals? (c)(5)

(d) Protection of fire detectors.

Is fire detection equipment installed outdoors or in the presence of corrosive atmospheres protected from corrosion? (d)(1)

Is a canopy, hood, or other suitable protection provided for detection equipment requiring protection from the weather? (d)(1)

Is detection equipment located or otherwise protected from mechanical or physical impact which might render it inoperable? (d)(2)

1910.164 — FIRE DETECTION SYSTEMS

	YES	NO
Are detectors supported independently of their attachment to wires or tubing? (d)(3)		
(e) Response time.		
Are fire detection systems installed for the purpose of actuating fire extinguishment or suppression systems designed to operate in time to control or extinguish a fire? (e)(1)		
Are fire detection systems installed for the purpose of employee alarm and evacuation designed and installed to provide a warning for emergency action and safe escape of employees? (e)(2)		
Are alarms or devices initiated by fire detector actuation not delayed for more than 30 seconds unless such delay is necessary for the immediate safety of employees? (e)(3)		
When such delay is necessary, is it addressed in an emergency action plan meeting the requirements of 1910.38? (e)(3)		
(f) Number, location and spacing of detecting devices.		
Is the number, spacing and location of fire detectors based upon design data obtained from field experience, or tests, engineering surveys, the manufacturer's recommendations, or a recognized testing laboratory listing? (f)		

1910.165 — EMPLOYEE ALARM SYSTEMS

	YES	NO
(a) Scope and application.		
This section applies to all emergency employee alarms installed to meet a particular OSHA standard. This section does not apply to those discharge or supervisory alarms required on various fixed extinguishing systems or to supervisory alarms on fire suppression, alarm, or detection systems unless they are intended to be employee alarm systems. (a)(1)		
The requirements in this section that pertain to maintenance, testing and inspection shall apply to all local fire alarm signaling systems used for alerting employees regardless of the other functions of the system. (a)(2)		
All pre-discharge employee alarms installed to meet a particular OSHA standard shall meet the requirements of paragraphs (b)(1) through (b)(4), (c), and (d)(1) of this section. (a)(3)		
(b) General requirements.		
Does the employee alarm system provide warning for necessary emergency action as called for in the emergency action plan? (b)(1)		
Does the employee alarm system provide for reaction time for safe escape of employees from the workplace or the immediate work area? (b)(1)		
Is the employee alarm capable of being perceived above ambient noise or light levels by all employees in the affected portions of the workplace? (b)(2)		
Are tactile devices used to alert those employees who would not otherwise be able to recognize the audible or visual alarm? (b)(2)		
Is the employee alarm distinctive and recognizable as a signal to evacuate the work area or to perform actions designated under the emergency action plan? (b)(3)		
Is each employee given instructions as to the preferred means of reporting emergencies, such as manual pull box alarms, public address systems, radios or telephones? (b)(4)		

1910.165 — EMPLOYEE ALARM SYSTEMS

	YES	NO
Are emergency telephone numbers posted near telephones, or employee notice boards, and other conspicuous locations when telephones serve as a means of reporting emergencies? (b)(4)		
When a communication system also serves as the employee alarm system, do all emergency messages have priority over all nonemergency messages? (b)(4)		
Are procedures established for sounding emergency alarms in the workplace? (b)(5)		
When 10 or fewer employees are in a particular workplace, and direct voice communication is used for sounding the alarm, can all employees hear the alarm? (b)(5)		
(c) Installation and restoration.		
Are all devices, components, combinations of devices or systems constructed and installed to comply with this standard approved? (c)(1)		
Steam whistles, air horns, strobe lights or similar lighting devices, or tactile devices meeting the requirements of this section are considered to meet this requirement for approval. (c)(1)		
Are all employee alarm systems restored to normal operating condition as promptly as possible after each test or alarm? (c)(2)		
Are spare alarm devices and components subject to wear or destruction available in sufficient quantities and locations for prompt restoration of the system? (c)(2)		
(d) Maintenance and testing.		
Are all employee alarm systems maintained in operating condition except when undergoing repairs or maintenance? (d)(1)		
Is a test of the reliability and adequacy of nonsupervised employee alarm systems made every two months? (d)(2)		
Is a different actuation device used in each test of a multiactuation device system so that no individual device is used for two consecutive tests? (d)(2)		
Are power supplies maintained or replaced as often as is necessary to assure a fully operational condition? (d)(3)		
Are back-up means of alarm, such as employee runners or telephones, provided when systems are out of service? (d)(3)		
Is proper supervision given to employee alarm circuitry installed after January 1, 1981, which is capable of being supervised? (d)(4)		
Does employee alarm circuitry provide positive notification to assigned personnel whenever a deficiency exists in the system? (d)(4)		
Are all supervised employee alarm systems tested at least annually for reliability and adequacy? (d)(4)		
Are servicing, maintenance and testing of employee alarms done by persons trained in the designed operation and functions necessary for reliable and safe operation of the system? (d)(5)		
(e) Manual operation.		
Are manually operated actuation devices for use in conjunction with employee alarms unobstructed, conspicuous and readily accessible? (e)		

MONTHLY FIRE EXTINGUISHER INSPECTION GUIDE

See 1910.157 beginning on page L-06 for the specific requirements applicable to your establishment regarding portable fire extinguishers. The quick reference checklist below and the suggested records form on the next page are intended to help those employers, who are required to provide fire extinguishers, meet the requirements for monthly inspections. You may want to duplicate the form and the checklist guide for use by individual departments or supervisors.

Each fire extinguisher should be inspected for the following:

1. Is the extinguisher clean and well cared for? ☐ ☐
2. Has the extinguisher been charged and hydrostatically tested within the prescribed periods, and tagged to show the dates? ☐ ☐
3. Is the required seal intact? ☐ ☐
4. Is the discharge orifice clear and unobstructed? ☐ ☐
5. Is there indication that the cap, if any, may be crossthreaded on the collar or that threads are corroded? ☐ ☐
6. Is the shell of the extinguisher corroded, damaged, or dented in such a way as to suggest possible weakness? ☐ ☐
7. Are connections between the hose and the shell and nozzle secure? ☐ ☐
8. If the extinguisher is a pump-operated type, does the pump shaft operate freely? ☐ ☐
9. Is the location of the extinguisher readily accessible and plainly indicated so as to be visible at a distance? ☐ ☐
10. Is the extinguisher mounted at a convenient height? ☐ ☐
11. If of a type subject to freezing, is the extinguisher protected? ☐ ☐
12. Is the hanger fastened solidly so that the extinguisher is well supported? ☐ ☐
13. Is the extinguisher located too close to the hazard which it is to protect, so that it could not be reached in case of fire? ☐ ☐
14. Are employees in the area familiar with the operation and limitations of the extinguisher? ☐ ☐

Any extinguisher showing defects shall be given a complete maintenance check. ☐ ☐

MONTHLY FIRE EXTINGUISHER INSPECTION LOG

See Quick Reference Checklist on Other Side

onth: ______________________________ Complete and Return by: ______________

EXTINGUISHER NUMBER	TYPE	LOCATION	LAST DATE SHOWN ON INSPECTION TAG	INSPECTED BY (INITIAL/DATE)	CONDITION/COMMENT (ACTION REQUIRED)

Signature ______________________________
(Supervisor or Safety Director)

FIRE PROTECTION

YES NO

FIRE PREVENTION — QUICK CHECKLIST

This quick reference checklist is intended for use in routinely policing the work area, to spot and head off any potential problem situations. The more detailed specific checklists which follow OSHA Standards should also be consulted and used for your regularly scheduled inspection programs.

ELECTRICAL EQUIPMENT

Is all wiring serviceable, and no makeshift wiring in use?

Are extension cords of proper length and in serviceable condition?

Are motors and tools free of dirt and grease?

Are all lights and electrical fixtures clear of combustible materials?

Are fuse and control boxes kept clean and closed?

Are circuits properly fused?

In hazardous areas, is the electric equipment of the approved type for the requirement?

Are ground connections clean and tight?

FRICTION

Are machines properly lubricated?

Are machines properly adusted and/or aligned?

SPECIAL FIRE-HAZARD MATERIALS

Is storage of special flammables isolated?

Is nonmetal stock free of tramp metal?

WELDING AND CUTTING

Is the area surveyed for fire safety?

Are combustibles removed or covered?

Have permits been issed?

OPEN FLAMES

Are flames kept away from spray rooms and booths?

Are there gas leaks?

Are portable torches clear of flammable surfaces?

PORTABLE HEATERS

Are the heaters set up with ample horizontal and overhead clearances?

Are they safely mounted on noncombustible surfaces?

Are the heaters used as rubbish burners?

Are they secured against tipping or upset?

Have combustibles been removed or covered?

HOT SURFACES

Are the hot pipes clear of combustible materials?

Is there ample clearance around boilers and furnaces?

Are the ashes kept in metal containers?

Are soldering irons kept off combustible surfaces?

SMOKING AND MATCHES

Are "No Smoking" and "Smoking" areas clearly marked?

Are butt containers available and serviceable?

Is there discarded smoking material in prohibited areas?

SPONTANEOUS IGNITION

Is flammable waste material kept in closed, metal containers?

Are flammable waste material containers emptied frequently?

Are trash receptacles emptied daily?

Is piled material cool, dry, and well ventilated?

STATIC ELECTRICITY

Are flammable liquid dispensing vessels grounded or bonded?

Is moving machinery grounded?

Is proper humidity maintained?

HOUSEKEEPING

Is there an accumulation of rubbish?

Is there safe storage of flammables?

Are there leaks or drippings of flammables?

Are floors free of spills?

Are the fire doors unlocked and operating freely, with fusible links intact?

Are the premises free of unnecessary combustible materials?

Are passageways cleared of obstacles?

EXTINGUISHING EQUIPMENT

Is the equipment of the proper type? (See pg. L(a)-02)

Is it in the proper location?

Is the extinguishing equipment unobstructed?

Is the equipment clearly marked?

Is it in working order?

Is the service date current?

Are personnel trained in the use of the equipment?

APPENDIX A
FIRE BRIGADES – 1910.156
(NON-MANDATORY)

§ *1910.156 Fire brigades.*

1. *Scope.* This section does not require an employer to organize a fire brigade. However, if an employer does decide to organize a fire brigade, the requirements of this section apply.

2. *Pre-fire planning.* It is suggested that pre-fire planning be conducted by the local fire department and/or the workplace fire brigade in order for them to be familiar with the workplace and process hazards. Involvement with the local fire department or fire prevention bureau is encouraged to facilitate coordination and cooperation between members of the fire brigade and those who might be called upon for assistance during a fire emergency.

3. *Organizational statement.* In addition to the information required in the organizational statement, paragraph 1910.156(b)(1), it is suggested that the organizational statement also contain the following information: a description of the duties that the fire brigade members are expected to perform; the line authority of each fire brigade officer; the number of the fire brigade officers and number of training instructors; and a list and description of the types of awards or recognition that brigade members may be eligible to receive.

4. *Physical capability.* The physical capability requirement applies only to those fire brigade members who perform interior structural fire fighting. Employees who cannot meet the physical capability requirement may still be members of the fire brigade as long as such employees do not perform interior structural fire fighting. It is suggested that fire brigade members who are unable to perform interior structural fire fighting be assigned less stressful and physically demanding fire brigade duties, e.g., certain types of training, recordkeeping, fire prevention inspection and maintenance, and fire pump operations.

Physically capable can be defined as being able to perform those duties specified in the training requirements of section 1910.156(c). Physically capable can also be determined by physical performance tests or by a physical examination when the examining physician is aware of the duties that the fire brigade member is expected to perform.

It is also recommended that fire brigade members participate in a physical fitness program. There are many benefits which can be attributed to being physically fit. It is believed that physical fitness may help to reduce the number of sprain and strain injuries as well as contributing to the improvement of the cardiovascular system.

5. *Training and education.* The paragraph on training and education does not contain specific training and education requirements because the type, amount, and frequency of training and education will be as varied as are the purposes for which fire brigades are organized. However, the paragraph does require that training and education be commensurate with those functions that the fire brigade is expected to perform; i.e., those functions specified in the organizational statement. Such a performance requirement provides the necessary flexibility to design a training program which meets the needs of individual fire brigades.

At a minimum, hands-on training is required to be conducted annually for all fire brigade members. However, for those fire brigade members who are expected to perform interior structural fire fighting, some type of training or education session must be provided at least quarterly.

In addition to the required hands-on training, it is strongly recommended that fire brigade members receive other types of training and education such as: classroom instruction, review of emergency action procedures, pre-fire planning, review of special hazards in the workplace, and practice in the use of self-contained breathing apparatus.

It is not necessary for the employer to duplicate the same training or education that a fire brigade member receives as a member of a community volunteer fire department, rescue squad, or similar organization. However, such training or education must have been provided to the fire brigade member within the past year and it must be documented that the fire brigade member has received the training or education. For example: there is no need for a fire brigade member to receive another training class in the use of positive-pressure self-contained breathing apparatus if the fire brigade member has recently completed such training as a member of a community fire department. Instead, the fire brigade member should receive training or education covering other important equipment or duties of the fire brigade as they relate to the workplace hazards, facilities and processes.

It is generally recognized that the effectiveness of fire brigade training and education depends upon the expertise of those providing the training and education as well as the motivation of the fire brigade members. Fire brigade training instructors must receive a higher level of training and education than the fire brigade members they will be teaching. This includes being more knowledgeable about the functions to be performed by the fire brigade and the hazards involved. The instructors should be qualified to train fire brigade members and demonstrate skills in communication, methods of teaching, and motivation. It is important for instructors and fire brigade members alike to be motivated toward the goals of the fire brigade and be aware of the importance of the service that they are providing for the protection of other employees and the workplace.

It is suggested that publications from the International Fire Service Training Association, the National Fire Protection Association (NFPA–1041), the International Society of Fire Service Instructors and other fire training sources be consulted for recommended qualifications of fire brigade training instructors.

In order to be effective, fire brigades must have competent leadership and supervision. It is important for those who supervise the fire brigade during emergency situations, e.g., fire brigade chiefs, leaders, etc., to receive the necessary training and education for supervising fire brigade activities during these hazardous and stressful situations. These fire brigade members with leadership responsibilities should demonstrate skills in strategy and tactics, fire suppression and prevention techniques, leadership principles, pre-fire planning, and safety practices. It is again suggested that fire service training sources be consulted for determining the kinds of training and education which are necessary for those with fire brigade leadership responsibilities.

It is further suggested that fire brigade leaders and fire brigade instructors receive more formalized training and education on a continuing basis by attending classes provided by such training sources as universities and university fire extension services.

The following recommendations should not be considered to be all of the necessary elements of a complete comprehensive training program, but the information may be helpful as a guide in developing a fire brigade training program.

All fire brigade members should be familiar with exit facilities and their location, emergency escape routes for handicapped workers, and the workplace "emergency action plan."

In addition, fire brigade members who are expected to control and extinguish fires in the incipient stage should, at a minimum, be trained in the use of fire extinguishers, standpipes, and other fire equipment they are assigned to use. They should also be aware of first aid medical procedures and procedures for dealing with special hazards to which they may be exposed. Training and education should include both classroom instruction and actual operation of the equipment under simulated emergency conditions. Hands-on type training must be conducted at least annually but some functions should be reviewed more often.

In addition to the above training, fire brigade members who are expected to perform emergency rescue and interior structural fire fighting should, at a minimum, be familiar with the proper techniques in rescue and fire suppression procedures. Training and education should include fire protection courses, classroom training, simulated fire situations including "wet drills" and, when feasible, extinguishment of actual mock fires. Frequency of training or education must be at least quarterly, but some drills or classroom training should be conducted as often as monthly or even weekly to maintain the proficiency of fire brigade members.

There are many excellent sources of training and education that the employer may want to use in developing a training program for the workplace fire brigade. These sources include publications, seminars, and courses offered by universities.

There are also excellent fire school courses by such facilities as Texas A and M University, Delaware State Fire School, Lamar University, and Reno Fire School, that deal with those unique hazards which may be encountered by fire brigades in the oil and chemical industry. These schools, and others, also offer excellent training courses which would be beneficial to fire brigades in other types of industries. These courses should be a continuing part of the training program, and employers are strongly encouraged to take advantage of these excellent resources.

It is also important that fire brigade members be informed about special hazards to which they may be exposed during fire and other emergencies. Such hazards as storage and use areas of flammable liquids and gases, toxic chemicals, water-reactive substances, etc., can pose difficult problems. There must be written procedures developed that describe the actions to be taken in situations involving special hazards. Fire brigade members must be trained in handling these special hazards as well as keeping abreast of any changes that occur in relation to these special hazards.

6. *Fire fighting equipment.* It is important that fire fighting equipment that is in damaged or unserviceable condition be removed from service and replaced. This will prevent fire brigade members from using unsafe equipment by mistake.

Fire fighting equipment, except portable fire extinguishers and respirators, must be inspected at least annually. Portable fire extinguishers and respirators are required to be inspected at least monthly.

7. *Protective clothing.* (A) *General.* Paragraph (e) of § 1910.156 does not require all fire brigade members to wear protective clothing. It is not the intention of these standards to require employers to provide a full ensemble of protective clothing for every fire brigade member without consideration given to the types of hazardous environments to which the fire brigade member might be exposed. It is the intention of these standards to require adequate protection for those fire brigade members who might be exposed to fires in an advanced stage, smoke, toxic gases, and high temperatures. Therefore, the protective clothing requirements only apply to those fire brigade members who perform interior structural fire fighting operations.

Additionally, the protective clothing requirements do not apply to the protective clothing worn during outside fire fighting operations (brush and forest fires, crash crew operations) or other special fire fighting activities. It is important that the protective clothing to be worn during these types of fire fighting operations reflect the hazards which are expected to be encountered by fire brigade members.

(B) *Foot and leg protection.* Section 1910. 156 permits an option to achieve foot and leg protection.

The section recognizes the interdependence of protective clothing to cover one or more parts of the body. Therefore, an option is given so that fire brigade members may meet the foot and leg requirements by either wearing long fire-resistive coats in combination with fully extended boots, or by wearing shorter fire-resistive costs in combination with protective trousers and protective shoes or shorter boots.

(C) *Body protection.* Paragraph (e)(3) of § 1910.156 provides an option for fire brigade members to achieve body protection. Fire brigade members may wear a fire-resistive coat in combination with fully extended boots, or they may wear a fire-resistive coat in combination with protective trousers.

Fire-resistive coats and protective trousers meeting all of the requirements contained in NFPA 1971–1975 "Protective Clothing for Structural Fire Fighters," are acceptable as meeting the requirements of this standard.

The lining is required to be permanently attached to the outer shell. However, it is permissible to attach the lining to the outer shell material by stitching in one area such as at the neck. Fastener tape or snap fasteners may be used to secure the rest of the lining to the outer shell to facilitate cleaning. Reference to permanent lining does not refer to a winter liner which is a detachable extra lining used to give added protection to the wearer against the effects of cold weather and wind.

(D) *Hand protection.* The requirements of the paragraph on hand protection may be met by protective gloves or a glove system. A glove system consists of a combination of different gloves. The usual components of a glove system consist of a pair of gloves, which provide thermal insulation to the hands, worn in combination with a second pair of gloves which provide protection against flame, cut, and puncture.

It is suggested that protective gloves provide dexterity and a sense of feel for objects. Criteria and test methods for dexterity are contained in the NIOSH publications, ''The Development of Criteria for Firefighters' Gloves; Vol. I: Glove Requirements'' and ''Vol. II: Glove Criteria and Test Methods.'' These NIOSH publications also contain a permissible modified version of Federal Test Method 191, Method 5903, (paragraph (3) of Appendix E) for flame resistance when gloves, rather than glove material, are tested for flame resistance.

(E) *Head, eye, and face protection.* Head protective devices which meet the requirements contained in NFPA No. 1972 are acceptable as meeting the requirements of this standard for head protection.

Head protective devices are required to be provided with ear flaps so that the ear flaps will be available if needed. It is recommended that ear protection always be used while fighting interior structural fires.

Many head protective devices are equipped with face shields to protect the eyes and face. These face shields are permissible as meeting the eye and face protection requirements of this paragraph as long as such face shields meet the requirements of § 1910.133 of the General Industry Standards.

Additionally, full facepieces, helmets or hoods of approved breathing apparatus which meet the requirements of § 1910.134 and paragraph (f) of § 1910.156 are also acceptable as meeting the eye and face protection requirements.

It is recommended that a flame resistant protective head covering such as a hood or snood, which will not adversely affect the seal of a respirator facepiece, be worn during interior structural fire fighting operations to protect the sides of the face and hair.

8. *Respiratory protective devices.* Respiratory protection is required to be worn by fire brigade members while working inside buildings or confined spaces where toxic products of combustion or an oxygen deficiency is likely to be present; respirators are also to be worn during emergency situations involving toxic substances. When fire brigade members respond to emergency situations, they may be exposed to unknown contaminants in unknown concentrations. Therefore, it is imperative that fire brigade members wear proper respiratory protective devices during these situations. Additionally, there are many instances where toxic products of combustion are still present during mop-up and overhaul operations. Therefore, fire brigade members should continue to wear respirators during these types of operations.

Self-contained breathing apparatus are not required to be equipped with either a buddy-breathing device or a quick-disconnect valve. However, these accessories may be very useful and are acceptable as long as such accessories do not cause damage to the apparatus, restrict the air flow of the apparatus, or obstruct the normal operation of the apparatus.

Buddy-breathing devices are useful for emergency situations where a victim or another fire brigade member can share the same air supply with the wearer of the apparatus for emergency escape purposes.

The employer is encouraged to provide fire brigade members with an alternative means of respiratory protection to be used only for emergency escape purposes if the self-contained breathing apparatus becomes inoperative. Such alternative means of respiratory protection may be either a buddy-breathing apparatus (ESCBA). The ESCBA is a short-duration respiratory protective device which is approved for only emergency escape purposes. It is suggested that if ESCBA units are used, that they be of at least 5 minutes service life.

Quick-disconnect valves are devices which start the flow of air by insertion of the hose (which leads to the facepiece) into the regulator of self-contained breathing apparatus, and stop the flow of air by disconnecting the hose from the regulator. These devices are particularly useful for those positive pressure self-contained breathing apparatus which do not have the capability of being switched from the demand to the positive-pressure mode.

The use of a self-contained breathing apparatus where the apparatus can be switched from a demand to a positive-pressure mode is acceptable as long as the apparatus is in the positive-pressure mode when performing interior structural fire fighting operations. Also acceptable are approved respiratory protective devices which have been converted to the positive-pressure type when such modification is accomplished by trained and experienced persons using kits or parts approved by NIOSH and provided by the manufacturer and by following the manufacturer's instructions.

There are situations which require the use of respirators which have a duration of 2 hours or more. Presently, there are no approved positive-pressure apparatus with a rated service life of more than 2 hours. Consequently, negative-pressure self-contained breathing apparatus with a rated service life of more than 2 hours and which have a minimum protection factor of 5,000 as determined by an acceptable quantitative fit test performed on each individual, will be acceptable for use during situations which require long duration apparatus. Long duration apparatus may be needed in such instances as working in tunnels, subway systems, etc. Such negative-pressure breathing apparatus will continue to be acceptable for a maximum of 18 months after a positive-pressure apparatus with the same or longer rated service life of more than 2 hours is certified by NIOSH/MSHA. After this 18 month phase-in period, all self-contained breathing apparatus used for these long duration situations will have to be of the positive-pressure type.

Protection factor (sometimes called fit factor) is defined as the ratio of the contaminant concentrations outside of the respirator to the contaminant concentrations inside the facepiece of the respirator.

$$PF = \frac{\text{Concentration outside respirator}}{\text{Concentration inside facepiece}}$$

Protection factors are determined by quantitative fit tests. An acceptable quantitative fit test should include the following elements:

1. A fire brigade member who is physically and medically capable of wearing respirators, and who is trained in the use of respirators, dons a self-contained breathing apparatus equipped with a device that will monitor the concentration of a contaminant inside the facepiece.

2. The fire brigade member then performs a qualitative fit test to assure the best face to facepiece seal as possible. A qualitative fit test can consist of a negative-pressure test, positive-pressure test, isoamyl acetate vapor (banana oil) test, or an irritant smoke test. For more details on respirator fitting see the NIOSH booklet entitled "A Guide to Industrial Respiratory Protection" June, 1976, and HEW publication No. (NIOSH) 76–189.

3. The wearer should then perform physical activity which reflects the level of work activity which would be expected during fire fighting activities. The physical activity should include simulated fire-ground work activity or physical exercise such as running-in-place, a step test, etc.

4. Without readjusting the apparatus, the wearer is placed in a test atmosphere containing a non-toxic contaminant with a known, constant, concentration.

The protection factor is then determined by dividing the known concentration of the contaminant in the test atmosphere by the concentration of the contaminant inside the facepiece when the following exercises are performed:

(a) Normal breathing with head motionless for one minute;

(b) Deep breathing with head motionless for 30 seconds;

(c) Turning head slowly from side to side while breathing normally, pausing for at least two breaths before changing direction. Continue for at least one minute;

(d) Moving head slowly up and down while breathing normally, pausing for at least two breaths before changing direction. Continue for at least two minutes;

(e) Reading from a prepared text, slowly and clearly, and loudly enough to be heard and understood. Continue for one minute; and

(f) Normal breathing with head motionless for at least one minute.

The protection factor which is determined must be at least 5,000. The quantitative fit test should be conducted at least three times. It is acceptable to conduct all three tests on the same day. However, there should be at least one hour between tests to reflect the protection afforded by the apparatus during different times of the day.

The above elements are not meant to be a comprehensive, technical description of a quantitative fit test protocol. However, quantitative fit test procedures which include these elements are acceptable for determining protection factors. Procedures for a quantitative fit test are required to be available for inspection by the Assistant Secretary or authorized representative.

Organizations such as Los Alamos Scientific Laboratory, Lawrence Livermore Laboratory, NIOSH, and American National Standards Institute (ANSI) are excellent sources for additional information concerning qualitative and quantitative fit testing.

§1910.157 Portable fire extinguishers.

1. *Scope and application.* The scope and application of this section is written to apply to three basic types of workplaces. First, there are those workplaces where the employer has chosen to evacuate all employees from the workplace at the time of a fire emergency. Second, there are those workplaces where the employer has chosen to permit certain employees to fight fires and to evacuate all other non-essential employees at the time of a fire emergency. Third, there are those workplaces where the employer has chosen to permit all employees in the workplace to use portable fire extinguishers to fight fires.

The section also addresses two kinds of work areas. The entire workplace can be divided into outside (exterior) work areas and inside (interior) work areas. This division of the workplace into two areas is done in recognition of the different types of hazards employees may be exposed to during fire fighting operations. Fires in interior workplaces, pose a greater hazard to employees; they can produce greater exposure to quantities of smoke, toxic gases, and heat because of the capability of a building or structure to contain or entrap these products of combustion until the building can be ventilated. Exterior work areas, normally open to the environment, are somewhat less hazardous, because the products of combustion are generally carried away by the thermal column of the fire. Employees also have a greater selection of evacuation routes if it is necessary to abandon fire fighting efforts.

In recognition of the degree of hazard present in the two types of work areas, the standards for exterior work areas are somewhat less restrictive in regards to extinguisher distribution. Paragraph (a) explains this by specifying which paragraphs in the section apply.

2. *Portable fire extinguisher exemptions.* In recognition of the three options given to employers in regard to the amount of employee evacuation to be carried out, the standards permit certain exemptions based on the number of employees expected to use fire extinguishers.

Where the employer has chosen to totally evacuate the workplace at the time of a fire emergency and when fire extinguishers are not provided, the requirements of this section do not apply to that workplace.

Where the employer has chosen to partially evacuate the workplace or the effected area at the time of a fire emergency and has permitted certain designated employees to remain behind to operate critical plant operations or to fight fires with extinguishers, then the employer is exempt from the distribution requirements of this section. Employees who will be remaining behind to perform incipient fire fighting or members of a fire brigade must be trained in their duties. The training must result in the employees becoming familiar with the locations of fire extinguishers. Therefore, the employer must locate the extinguishers in convenient locations where the employees know they can be found. For example, they could be mounted in the fire truck or cart that the fire brigade uses when it responds to a fire emergency. They can also be distributed as set forth in the National Fire Protection Association's Standard No. 10, "Portable Fire Extinguishers."

Where the employer has decided to permit all employees in the workforce to use fire extinguishers, then the entire OSHA section applies.

3. *Portable fire extinguisher mounting.* Previous standards for mounting fire extinguishers have been criticized for requiring specific mounting locations. In recognition of this criticism, the standard has been rewritten to permit as much flexibility in extinguisher mounting as is acceptable to assure that fire extinguishers are available when needed and that employees are not subjected to injury hazards when they try to obtain an extinguisher.

It is the intent of OSHA to permit the mounting of extinguishers in any location that is accessible to employees without the use of portable devices such as a ladder. This limitation is necessary because portable devices can be moved or taken from the place where they are needed and, therefore, might not be available at the time of an emergency.

Employers are given as much flexibility as possible to assure that employees can obtain extinguishers as fast as possible. For example, an acceptable method of mounting extinguishers in areas where fork lift trucks or tow-motors are used is to mount the units on retractable boards which, by means of counterweighting, can be raised above the level where they could be struck by vehicular traffic. When needed, they can be lowered quickly for use. This method of mounting can also reduce vandalism and unauthorized use of extinguishers. The extinguishers may also be mounted as outlined in the National Fire Protection Association's Standard No. 10, "Portable Fire Extinguishers."

4. *Selection and distribution.* The employer is responsible for the proper selection and distribution of fire extinguishers and the determination of the necessary degree of protection. The selection and distribution of fire extinguishers must reflect the type and class of fire hazards associated with a particular workplace.

Extinguishers for protecting Class A hazards may be selected from the following types: water, foam, loaded stream, or multipurpose dry chemical. Extinguishers for protecting Class B hazards may be selected from the following types: Halon 1301, Halon 1211, carbon dioxide, dry chemicals, foam, or loaded stream. Extinguishers for Class C hazards may be selected from the following types: Halon 1301, Halon 1211, carbon dioxide, or dry chemical.

Combustible metal (Class D hazards) fires pose a different type of fire problem in the workplace. Extinguishers using water, gas, or certain dry chemicals cannot extinguish or control this type of fire. Therefore, certain metals have specific dry powder extinguishing agents which can extinguish or control this type of fire. Those agents which have been specifically approved for use on certain metal fires provide the best protection; however, there are also some "universal" type agents which can be used effectively on a variety of combustible metal fires if necessary. The "universal" type agents include: Foundry flux, Lith-X powder, TMB liquid, pyromet powder, TEC powder, dry talc, dry graphite powder, dry sand, dry sodium chloride, dry soda ash, lithium chloride, zirconium silicate, and dry dolomite.

Water is not generally accepted as an effective extinguishing agent for metal fires. When applied to hot burning metal, water will break down into its basic atoms of oxygen and hydrogen. This chemical breakdown contributes to the combustion of the metal. However, water is also a good universal coolant and can be used on some combustible metals, but only under proper conditions and application, to reduce the temperature of the burning metal below the ignition point. For example, automatic deluge systems in magnesium plants can discharge such large quantities of water on burning magnesium that the fire will be extinguished. The National Fire Protection Association has specific standards for this type of automatic sprinkler system. Further information on the control of metal fires with water can be found in the National Fire Protection Association's *Fire Protection Handbook.*

An excellent source of selection and distribution criteria is found in the National Fire Protection Association's Standard No. 10. Other sources of information include the National Safety Council and the employer's fire insurance carrier.

5. *Substitution of standpipe systems for portable fire extinguishers.* The employer is permitted to substitute acceptable standpipe systems for portable fire extinguishers under certain circumstances. It is necessary to assure that any substitution will provide the same coverage that portable units provide. This means that fire hoses, because of their limited portability, must be spaced throughout the protected area so that they can reach around obstructions such as columns, machinery, etc. and so that they can reach into closets and other enclosed areas.

6. *Inspection, maintenance and testing.* The ultimate responsibility for the inspection, maintenance and testing of portable fire extinguishers lies with the employer. The actual inspection, maintenance, and testing may, however, be conducted by outside contractors with whom the employer has arranged to do the work. When contracting for such work, the employer should assure that the contractor is capable of performing the work that is needed to comply with this standard.

If the employer should elect to perform the inspection, maintenance, and testing requirements of this section in-house, then the employer must make sure that those persons doing the work have been trained to do the work and to recognize problem areas which could cause an extinguisher to be inoperable. The National Fire Protection Association provides excellent guidelines in its standard for portable fire extinguishers. The employer may also check with the manufacturer of the unit that has been purchased and obtain guidelines on inspection, maintenance, and testing. Hydrostatic testing is a process that should be left to contractors or individuals using suitable facilities and having the training necessary to perform the work.

Anytime the employer has removed an extinguisher from service to be checked or repaired, alternate equivalent protection must be provided. Alternate equivalent protection could include replacing the extinguisher with one or more units having equivalent or equal ratings, posting a fire watch, restricting the unprotected area from employee exposure, or providing a hose system ready to operate.

7. *Hydrostatic testing.* As stated before, the employer may contract for hydrostatic testing. However, if the employer wishes to provide the testing service, certain equipment and facilities must be available. Employees should be made aware of the hazards associated with hydrostatic testing and the importance of using proper guards and water pressures. Severe injury can result if extinguisher shells fail violently under hydrostatic pressure.

Employers are encouraged to use contractors who can perform adequate and reliable service. Firms which have been certified by the Materials Transportation Board (MTB) of the U.S. Department of Transportation (DOT) or State licensed extinguisher servicing firms or recognized by the National Association of Fire Equipment Distributors in Chicago, Illinois, are generally acceptable for performing this service.

8. *Training and education.* This part of the standard is of the utmost importance to employers and employees if the risk of injury or death due to extinguisher use is to be reduced. If an employer is going to permit an employee to fight a workplace fire of any size, the employer must make sure that the employee knows everything necessary to assure the employee's safety.

Training and education can be obtained through many channels. Often, local fire departments in larger cities have fire prevention bureaus or similar organizations which can provide basic fire prevention training programs. Fire insurance companies will have data and information available. The National Fire Protection Association and the National Safety Council will provide, at a small cost, publications that can be used in a fire prevention program.

Actual fire fighting training can be obtained from various sources in the country. The Texas A & M University, the University of Maryland's Fire and Rescue Institute, West Virginia University's Fire Service Extension, Iowa State University's Fire Service Extension and other State training schools and land grant colleges have fire fighting programs directed to industrial applications. Some manufacturers of extinguishers, such as the Ansul Company and Safety First, conduct fire schools for customers in the proper use of extinguishers. Several large corporations have taken time to develop their own on-site training programs which expose employees to the actual "feeling" of fire fighting. Simulated fires for training of employees in the proper use of extinguishers are also an acceptable part of a training program.

In meeting the requirements of this section, the employer may also provide educational materials, without classroom instruction, through the use of employee notice campaigns using instruction sheets or flyers or similar types of informal programs. The employer must make sure that employees are trained and educated to recognize not only what type of fire is being fought and how to fight it, but also when it is time to get away from it and leave fire suppression to more experienced fire fighters.

§ 1910.158 Standpipe and hose systems.

1. *Scope and application.* This section has been written to provide adequate coverage of those standpipe and hose systems that an employer may install in the workplace to meet the requirements of a particular OSHA standard. For example, OSHA permits the substitution of hose systems for portable fire extinguishers in § 1910.157. If an employer chooses to provide hose systems instead of portable Class A fire extinguishers, then those hose systems used for substitution would have to meet the applicable requirements of § 1910.157. All other standpipe and hose systems not used as a substitute would be exempt from these requirements.

The section specifically exempts Class I large hose systems. By large hose systems, OSHA means those 2½ in (6.3 cm) hose lines that are usually associated with fire departments of the size that provide their own water supply through fire apparatus. When the fire gets to the size that outside protection of that degree is necessary, OSHA believes that in most industries employees will have been evacuated from the fire area and the "professional" fire fighters will take control.

2. *Protection of standpipes.* Employers must make sure that standpipes are protected

so that they can be relied upon during a fire emergency. This means protecting the pipes from mechanical and physical damage. There are various means for protecting the equipment such as, but not limited to, enclosing the supply piping in the construction of the building, locating the standpipe in an area which is inaccessible to vehicles, or locating the standpipe in a stairwell.

3. *Hose covers and cabinets.* The employer should keep fire protection hose equipment in cabinets or inside protective covers which will protect it from the weather elements, dirt or other damaging sources. The use of protective covers must be easily removed or opened to assure that hose and nozzle are accessible. When the employer places hose in a cabinet, the employer must make sure that the hose and nozzle are accessible to employees without subjecting them to injury. In order to make sure that the equipment is readily accessible, the employer must also make sure that the cabinets used to store equipment are kept free of obstructions and other equipment which may interfere with the fast distribution of the fire hose stored in the cabinet.

4. *Hose outlets and connections.* The employer must assure that employees who use standpipe and hose systems can reach the hose rack and hose valve without the use of portable equipment such as ladders. Hose reels are encouraged for use because one employee can retrieve the hose, charge it, and place it into service without much difficulty.

5. *Hose.* When the employer elects to provide small hose in lieu of portable fire extinguishers, those hose stations being used for the substitution must have hose attached and ready for service. However, if more than the necessary amount of small hose outlets are provided, hose does not have to be attached to those outlets that would provide redundant coverage. Further, where the installation of hose on outlets may expose the hose to extremely cold climates, the employer may store the hose in houses or similar protective areas and connect it to the outlet when needed.

There is approved lined hose available that can be used to replace unlined hose which is stored on racks in cabinets. The lined hose is constructed so that it can be folded and placed in cabinets in the same manner as unlined hose.

Hose is considered to be unserviceable when it deteriorates to the extent that it can no longer carry water at the required pressure and flow rates. Dry rotted linen or hemp hose, cross threaded couplings, and punctured hose are examples of unserviceable hose.

6. *Nozzles.* Variable stream nozzles can provide useful variations in water flow and spray patterns during fire fighting operations and they are recommended for employee use. It is recommended that 100 psi (700 kPa) nozzle pressure be used to provide good flow patterns for variable stream nozzles. The most desirable attribute for nozzles is the ability of the nozzle person to shut off the water flow at the nozzle when it is necessary. This can be accomplished in many ways. For example, a shut-off nozzle with a lever or rotation of the nozzle to stop flow would be effective, but in other cases a simple globe valve placed between a straight stream nozzle and the hose could serve the same purpose. For straight stream nozzles 50 psi nozzle pressure is recommended. The intent of this standard is to protect the employee from "run-away" hoses if it becomes necessary to drop a pressurized hose line and retreat from the fire front and other related hazards.

7. *Design and installation.* Standpipe and hose systems designed and installed in accordance with NFPA Standard No. 14–1976, "Standpipe and Hose Systems," are considered to be in compliance with this standard.

§ *1910.159 Automatic sprinkler systems.*

1. *Scope and application.* This section contains the minimum requirements for design, installation and maintenance of sprinkler systems that are needed for employee safety. The Occupational Safety and Health Administration is aware of the fact that the National Board of Fire Underwriters is no longer an active organization, however, sprinkler systems still exist that were designed and installed in accordance with that organization's standards. Therefore, OSHA will recognize sprinkler systems designed to, and maintained in accordance with, NBFU and earlier NFPA standards.

2. *Exemptions.* In an effort to assure that employers will continue to use automatic sprinkler systems as the primary fire protection system in workplaces, OSHA is exempting from coverage those systems not required by a particular OSHA standard and which have been installed in workplaces solely for the purpose of protecting property. Many of these types of systems are installed in areas or buildings with little or no employee exposure. An example is those warehouses where employees may enter occasionally to take inventory or move stock. Some employers may choose to shut down those systems which are not specifically required by OSHA rather than upgrade them to comply with the standards. OSHA does not intend to regulate such systems. OSHA only intends to regulate those systems which are installed to comply with a particular OSHA standard.

3. *Design.* There are two basic types of sprinkler system design. Pipe schedule designed systems are based on pipe schedule tables developed to protect hazards with standard sized pipe, number of sprinklers, and pipe lengths. Hydraulic designed systems are based on an engineered design of pipe size which will produce a given water density or flow rate at any particular point in the system. Either design can be used to comply with this standard.

The National Fire Protection Association's Standard No. 13, "Automatic Sprinkler Systems," contains the tables needed to design and install either type of system. Minimum water supplies, densities, and pipe sizes are given for all types of occupancies.

The employer may check with a reputable fire protection engineering consultant or sprinkler design company when evaluating existing systems or designing a new installation.

With the advent of new construction materials for the manufacuture of sprinkler pipe, materials, other than steel have been approved for use as sprinkler pipe. Selection of pipe material should be made on the basis of the type of installation and the acceptability of the material to local fire and building officials where such systems may serve more than one purpose.

Before new sprinkler systems are placed into service, an acceptance test is to be conducted. The employer should invite the installer, designer, insurance representative, and a local fire official to witness the test. Problems found during the test are to be corrected before the system is placed into service.

4. *Maintenance.* It is important that any sprinkler system maintenance be done only when there is minimal employee exposure to the fire hazard. For example, if repairs or changes to the system are to be made, they should be made during those hours when employees are not working or are not occupying that portion of the workplace protected by the portion of the system which has been shut down.

The procedures for performing a flow test via a main drain test or by the use of an inspector's test valve can be obtained from the employer's fire insurance company or from the National Fire Protection Association's Standard No. 13A, "Sprinkler System, Maintenance."

5. *Water supplies.* The water supply to a sprinkler system is one of the most important factors an employer should consider when evaluationg a system. Obviously, if there is no water supply, the system is useless. Water supplies can be lost for various reasons such as improperly closed valves, excessive demand, broken water mains, and broken fire pumps. The employer must be able to determine if or when this type of condition exists either by performing a main drain test or visual inspection. Another problem may be an inadequate water supply. For example, a light hazard occupancy may, through rehabilitation or change in tenants, become an ordinary or high hazard occupancy. In such cases, the existing water supply may not be able to provide the pressure or duration necessary for proper protection. Employers must assure that proper design and tests have been made to assure an adequate water supply. These tests can be arranged through the employer's fire insurance carrier or through a local sprinkler maintenance company or through the local fire prevention organization.

Anytime the employer must shut down the primary water supply for a sprinkler system, the standard requires that equivalent protection be provided. Equivalent protection may include a fire watch with extinguishers or hose lines in place and manned, or a secondary water supply such as a tank truck and pump, or a tank or fire pond with fire pumps, to protect the areas where the primary water supply is limited or shut down. The employer may also require evacuation of the workplace and have an emergency action plan which specifies such action.

6. *Protection of piping.* Piping which is exposed to corrosive atmospheres, either chemical or natural, can become defective to

the extent that it is useless. Employers must assure that piping is protected from corrosion by its material of construction, e.g., stainless steel, or by a protective coating, e.g., paint.

7. *Sprinklers.* When an employer finds it necessary to replace sprinkler system components or otherwise change a sprinkler's design, employer should make a complete fire protection engineering survey of that part of the system being changed. This review should assure that the changes to the system will not alter the effectiveness of the system as it is presently designed. Water supplies, densities and flow characteristics should be maintained.

8. *Protection of sprinklers.* All components of the system must be protected from mechanical impact damage. This can be achieved with the use of mechanical guards or screens or by locating components in areas where physical contact is impossible or limited.

9. *Sprinkler alarms.* The most recognized sprinkler alarm is the water motor gong or bell that sounds when water begins to flow through the system. This is not however, the only type of acceptable water flow alarm. Any alarm that gives an indication that water is flowing through the system is acceptable. For example, a siren, a whistle, a flashing light, or similar alerting device which can transmit a signal to the necessary persons would be acceptable. The purpose of the alarm is to alert persons that the system is operating, and that some type of planned action is necessary.

10. *Sprinkler spacing.* For a sprinkler system to be effective there must be an adequate discharge of water spray from the sprinkler head. Any obstructions which hinder the designed density or spray pattern of the water may create unprotected areas which can cause fire to spread. There are some sprinklers that, because of the system's design, are deflected to specific areas. This type of obstruction is acceptable if the system's design takes it into consideration in providing adequate coverage.

§ 1910.160 Fixed extinguishing systems, general.

1. *Scope and application.* This section contains the general requirements that are applicable to all fixed extinguishing systems installed to meet OSHA standards. It also applies to those fixed extinguishing systems, generally total flooding, which are not required by OSHA, but which, because of the agent's discharge, may expose employees to hazardous concentrations of extinguishing agents or combustion by-products. Employees who work around fixed extinguishing systems must be warned of the possible hazards associated with the system and its agent. For example, fixed dry chemical extinguishing systems may generate a large enough cloud of dry chemical particles that employees may become visually disoriented. Certain gaseous agents can expose employees to hazardous by-products of combustion when the agent comes into contact with hot metal or other hot surface. Some gaseous agents may be present in hazardous concentrations when the system has totally discharged because an extra rich concentration is necessary to extinguish deep-seated fires. Certain local application systems may be designed to discharge onto the flaming surface of a liquid, and it is possible that the liquid can splatter when hit with the discharging agent. All of these hazards must be determined before the system is placed into operation, and must be discussed with employees.

Based on the known toxicological effects of agents such as carbon tetrachloride and chlorobromomethane, OSHA is not permitting the use of these agents in areas where employees can be exposed to the agent or its side effects. However, chlorobromomethane has been accepted and may be used as an explosion suppression agent in unoccupied spaces. OSHA is permitting the use of this agent only in areas where employees will not be exposed.

2. *Distinctive alarm signals.* A distinctive alarm signal is required to indicate that a fixed system is discharging. Such a signal is necessary on those systems where it is not immediately apparent that the system is discharging. For example, certain gaseous agents make a loud noise when they discharge. In this case no alarm signal is necessary. However, where systems are located in remote locations or away from the general work area and where it is possible that a system could discharge without anyone knowing that it is doing so, then a distinctive alarm is necessary to warn employees of the hazards that may exist. The alarm can be a bell, gong, whistle, horn, flashing light, or any combination of signals as long as it is identifiable as a discharge alarm.

3. *Maintenance.* The employer is responsible for the maintenance of all fixed systems, but this responsibility does not preclude the use of outside contractors to do such work. New systems should be subjected to an acceptance test before placed in service. The employer should invite the installer, designer, insurance representative and others to witness the test. Problems found during the test need to be corrected before the system is considered operational.

4. *Manual discharge stations.* There are instances, such as for mechanical reasons and others, where the standards call for a manual back-up activation device. While the location of this device is not specified in the standard, the employer should assume that the device should be located where employees can easily reach it. It could, for example, be located along the main means of egress from the protected area so that employees could activate the system as they evacuate the work area.

5. *Personal protective equipment.* The employer is required to provide the necessary personal protective equipment to rescue employees who may be trapped in a totally flooded environment which may be hazardous to their health. This equipment would normally include a positive-pressure self-contained breathing apparatus and any necessary first aid equipment. In cases where the employer can assure the prompt arrival of the local fire department or plant emergency personnel which can provide the equipment, this can be considered as complying with the standards.

§ 1910.161 Fixed extinguishing systems, dry chemical.

1. *Scope and application.* The requirements of this section apply only to dry chemical systems. These requirements are to be used in conjunction with the requirements of § 1910.160.

2. *Maintenance.* The employer is responsible for assuring that dry chemical systems will operate effectively. To do this, periodic maintenance is necessary. One test that must be conducted during the maintenance check is one which will determine if the agent has remained free of moisture. If an agent absorbs any moisture, it may tend to cake and thereby clog the system. An easy test for acceptable moisture content is to take a lump of dry chemical from the container and drop it from a height of four inches. If the lump crumbles into fine particles, the agent is acceptable.

§ 1910.162 Fixed extinguishing systems, gaseous agent.

1. *Scope and application.* This section applies only to those systems which use gaseous agents. The requirements of § 1910.160 also apply to the gaseous agent systems covered in this section.

2. *Design concentrations.* Total flooding gaseous systems are based on the volume of gas which must be discharged in order to produce a certain designed concentration of gas in an enclosed area. The concentration needed to extinguish a fire depends on several factors including the type of fire hazard and the amount of gas expected to leak away from the area during discharge. At times it is necessary to "super-saturate" a work area to provide for expected leakage from the enclosed area. In such cases, employers must assure that the flooded area has been ventilated before employees are permitted to reenter the work area without protective clothing and respirators.

3. *Toxic decomposition.* Certain halogenated hydrocarbons will break down or decompose when they are combined with high temperatures found in the fire environment. The products of the decomposition can include toxic elements or compounds. For example, when Halon 1211 is placed into contact with hot metal it will break down and form bromide or fluoride fumes. The employer must find out which toxic products may result from decomposition of a particular agent from the manufacturer, and take the necessary precautions to prevent employee exposure to the hazard.

§ 1910.163 Fixed extinguishing systems, water spray and foam.

1. *Scope and application.* This section applies to those systems that use water spray or foam. The requirements of § 1910.160 also apply to this type of system.

2. *Characteristics of foams.* When selecting the type of foam for a specific hazard, the employer should consider the following limitations of some foams.

a. Some foams are not acceptable for use on fires involving flammable gases and liquefied gases with boiling points below ambient workplace temperatures. Other foams are not effective when used on fires involving polar solvent liquids.

b. Any agent using water as part of the mixture should not be used on fire involving combustible metals unless it is applied under proper conditions to reduce the temperature of burning metal below the ignition temperature. The employer should use only those foams that have been tested and accepted for this application by a recognized independent testing laboratory.

c. Certain types of foams may be incompatible and break down when they are mixed together.

d. For fires involving water miscible solvents, employers should use only those foams tested and approved for such use. Regular protein foams may not be effective on such solvents.

Whenever employers provide a foam or water spray system, drainage facilities must be provided to carry contaminated water or foam overflow away from the employee work areas and egress routes. This drainage system should drain to a central impounding area where it can be collected and disposed of properly. Other government agencies may have regulations concerning environmental considerations.

§ *1910.164 Fire detection systems.*

1. *Installation and restoration.* Fire detection systems must be designed by knowledgeable engineers or other professionals, with expertise in fire detection systems and when the systems are installed, there should be an acceptance test performed on the system to insure it operates properly. The manufacturer's recommendations for system design should be consulted. While entire systems may not be approved, each component used in the system is required to be approved. Custom fire detection systems should be designed by knowledgeable fire protection or electrical engineers who are familiar with the workplace hazards and conditions. Some systems may only have one or two individual detectors for a small workplace, but good design and installation is still important. An acceptance test should be performed on all systems, including these smaller systems.

OSHA has a requirement that spare components used to replace those which may be destroyed during an alarm situation be available in sufficient quantities and locations for prompt restoration of the system. This does not mean that the parts or components have to be stored at the workplace. If the employer can assure that the supply of parts is available in the local community or the general metropolitan area of the workplace, then the requirements for storage and availability have been met. The intent is to make sure that the alarm system is fully operational when employees are occupying the workplace, and that when the system operates it can be returned to full service the next day or sooner.

2. *Supervision.* Fire detection systems should be supervised. The object of supervision is detection of any failure of the circuitry, and the employer should use any method that will assure that the system's circuits are operational. Electrically operated sensors for air pressure, fluid pressure, or electrical circuits, can provide effective monitoring and are the typical types of supervision.

3. *Protection of fire detectors.* Fire detectors must be protected from corrosion either by protective coatings, by being manufactured from non-corrosive materials or by location. Detectors must also be protected from mechanical impact damages, either by suitable cages or metal guards where such hazards are present, or by locating them above or out of contact with materials or equipment which may cause damage.

4. *Number, location, and spacing of detectors.* This information can be obtained from the approval listing for detectors or NFPA standards. It can also be obtained from fire protection engineers or consultants or manufacturers of equipment who have access to approval listings and design methods.

§ *1910.165 Employee alarm systems.*

1. *Scope and application.* This section is intended to apply to employee alarm systems used for all types of employee emergencies except those which occur so quickly and at such a rapid rate (e.g., explosions) that any action by the employee is extremely limited following detection.

In small workplaces with 10 or less employees the alarm system can be by direct voice communciation (shouting) where any one individual can quickly alert all other employees. Radio may be used to transmit alarms from remote workplaces where telephone service is not available, provided that radio messages will be monitored by emergency services, such as fire, police or others, to insure alarms are transmitted and received.

2. *Alarm signal alternatives.* In recognition of physically impaired individuals, OSHA is accepting various methods of giving alarm signals. For example, visual, tactile or audible alarm signals are acceptable methods for giving alarms to employees. Flashing lights or vibrating devices can be used in areas where the employer has fired employees with hearing or vision impairments. Vibrating devices, air fans, or other tactile devices can be used where visually and hearing impaired employees work. Employers are cautioned that certain frequencies of flashing lights have been claimed to initiate epileptic seizures in some employees and that this fact should be considered when selecting an alarm device. Two way radio communications would be most appropriate for transmitting emergency alarms in such workplaces which may be remote or where telephones may not be available.

3. *Reporting alarms.* Employee alarms may require different means of reporting, depending on the workplace involved. For example, in small workplaces, a simple shout throughout the workplace may be sufficient to warn employees of a fire or other emergency. In larger workplaces, more sophisticated equipment is necessary so that entire plants or high-rise buildings are not evacuated for one small emergency. In remote areas, such as pumping plants, radio communication with a central base station may be necessary. The goal of this standard is to assure that all employees who need to know that an emergency exists can be notified of the emergency. The method of transmitting the alarm should reflect the situation found at the workplace.

Personal radio transmitters, worn by an individual, can be used where the individual may be working such as in a remote location. Such personal radio transmitters shall send a distinct signal and should clearly indicate who is having an emergency, the location, and the nature of the emergency. All radio transmitters need a feedback system to assure that the emergency alarm is sent to the people who can provide assistance.

For multi-story buildings or single story buildings with interior walls for subdivisions, the more traditional alarm systems are recommended for these types of workplaces. Supervised telephone or manual fire alarm or pull box stations should be available within a travel distance of 200 feet (61 m). Water flow detection on a sprinkler system, fire detection systems (guard's supervisory station) or tour signal (watchman's service), or other related systems may be part of the overall system. The paging system may be used for nonemergency messages and uses will have precedence over all other uses of the system.

4. *Supervision.* The requirements for supervising the employee alarm system circuitry and power supply may be accomplished in a variety of ways. Typically, electrically operated sensors for air pressure, fluid pressure, steam pressure, or electrical continuity of circuitry may be used to continuously monitor the system to assure it is operational and to identify trouble in the system and give a warning signal.

APPENDIX B
SOURCE OF STANDARDS

National Consensus Standards

The following table contains a cross-reference listing of those current national consensus standards which contains information and guidelines that would be considered acceptable in complying with requirements in the specific sections of Subpart L.

Subpart L section	National consensus standard
1910.156	ANSI/NFPA No. 1972; Structural Fire Fighter's Helmets.
	ANSI Z88.5 American National Standard, Practice for Respirator Protection for the Fire Service.
	ANSI/NFPA No. 1971, Protective Clothing for Structural Fire Fighters.
	NFPA No. 1041, Fire Service Instructor Professional Qualifications.
1910.157	ANSI/NFPA No. 10, Portable Fire Extinguishers.
1910.158	ANSI/NFPA No. 18, Wetting Agents.
	ANSI/NFPA No. 20, Centrifugal Fire Pumps.
	NFPA No 21, Steam Fire Pumps
	ANSI/NFPA No 22, Water Tanks.
	NFPA No. 24, Outside Protection
	NFPA No 26, Supervision of Valves.
	NFPA No. 13E, Fire Department Operations in Properties Protected by Sprinkler, Standpipe Systems.
	ANSI/NFPA No. 194, Fire Hose Connections.
	NFPA No. 197, Initial Fire Attack, Training for.
	NFPA No. 1231, Water Supplies for Suburban and Rural Fire Fighting.
1910.159	ANSI-NFPA No. 13, Sprinkler Systems.
	NFPA No. 13A, Sprinkler Systems, Maintenance.
	ANSI/NFPA No. 18, Wetting Agents.
	ANSI/NFPA No. 20, Centrifugal Fire Pumps.
	ANSI/NFPA No. 22, Water Tanks.
	NFPA No. 24, Outside Protection.
	NFPA No. 26, Supervision of Valves.
	ANSI/NFPA No. 72B, Auxiliary Signaling Systems.
	NFPA No. 1231, Water Supplies for Suburban and Rural Fire Fighting.
1910.160	ANSI/NFPA No. 11, Foam Systems.
	ANSI/NFPA 11A, High Expansion Foam Extinguishing Systems.
	ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems.
	ANSI/NFPA No. 12, Carbon Dioxide Systems.
	ANSI/NFPA No. 12A, Halon 1301 Systems.
	ANSI/NFPA No. 12B, Halon 1211 Systems.
	ANSI/NFPA No. 15, Water Spray Systems.
	ANSI/NFPA 16 Foam-Water Spray Systems.
	ANSI/NFPA No. 17, Dry Chemical Systems.
	ANSI/NFPA 69, Explosion Suppression Systems.
1910.161	ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems.
	ANSI/NFPA No. 17, Dry Chemical Systems.
1910.162	ANSI/NFPA No. 12, Carbon Dioxide Systems.
	ANSI/NFPA No. 12A, Halon 1211 Systems.
	ANSI/NFPA No. 12B, Halon 1301 Systems.
	ANSI/NFPA No. 69, Explosion Suppression Systems.
1910.163	ANSI/NFPA No. 11, Foam Extinguishing Systems.
	ANSI/NFPA No. 11A, High Expansion Foam Extinguishing Systems.
	ANSI/NFPA No. 11B, Synthetic Foam and Combined Agent Systems.
	ANSI/NFPA No. 15, Water Spray Fixed Systems.
	ANSI/NFPA No. 16, Foam-Water Spray Systems.
	ANSI/NFPA No. 18, Wetting Agents.
	NFPA No. 26, Supervision of Valves.
1910.164	ANSI/NFPA No. 71, Central Station Signaling Systems.
	ANSI/NFPA No. 72A, Local Protective Signaling Systems.
	ANSI/NFPA No. 72B, Auxiliary Signaling Systems.
	ANSI/NFPA No. 72D, Proprietary Protective Signaling Systems.
	ANSI/NFPA No. 72E, Automatic Fire Detectors.
	ANSI/NFPA No. 101, Life Safety Code.
1910.165	ANSI/NFPA No. 71, Central Station Signaling Systems
	ANSI/NFPA No. 72A, Local Protective Signaling Systems.
	ANSI/NFPA No. 72B, Auxiliary Protective Signaling Systems.
	ANSI/NFPA No. 72C, Remote Station Protective Signaling Systems.
	ANSI/NFPA No. 72D, Proprietary Protective Signaling Systems.
	ANSI/NFPA No. 101, Life Safety Code.
Metric Conversion	ANSI/ASTM No. E380, American National Standard for Metric Practice.

NFPA standards are available from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 03210.

ANSI Standards are available from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

APPENDIX C
REFERENCES FOR FURTHER INFORMATION

I. *Appendix general references.* The following references provide information which can be helpful in understanding the requirements contained in all of the sections of Subpart L:

A. *Fire Protection Handbook,* National Fire Protection Association; 470 Atlantic Avenue, Boston, MA 02210.

B. *Accident Prevention Manual for Industrial Operations,* National Safety Council; 425 North Michigan Avenue, Chicago, IL 60611.

C. Various associations also publish information which may be useful in understanding these standards. Examples of these associations are: Fire Equipment Manufacturers Association (FEMA) of Arlington, VA 22204 and the National Association of Fire Equipment Distributors (NAFED) of Chicago, IL 60601.

II. *Appendix references applicable to individual sections.* The following references are grouped according to individual sections contained in Subpart L. These references provide information which may be helpful in understanding and implementing the standards of each section of Subpart L.

A. *§ 1910.156. Fire brigades:*

1. *Private Fire Brigades,* NFPA 27; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Initial Fire Attack, Training Standard On,* NFPA 197; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Fire Fighter Professional Qualifications,* NFPA 1001; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
4. *Organization for Fire Services,* NFPA 1201; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
5. *Organization of a Fire Department,* NFPA 1202; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
6. *Protective Clothing for Structural Fire Fighting,* ANSI/NFPA 1971; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
7. *American National Standard for Men's Safety-Toe Footwear,* ANSI Z41.1; American National Standards Institute, New York, NY 10018.
8. *American National Standard for Occupational and Educational Eye and Face Protection,* ANSI Z87.1; American National Standards Institute, New York, NY 10018.
9. *American National Standard, Safety Requirements for Industrial Head Protection,* ANSI Z89.1; American National Standards Institute, New York, NY 10018.
10. *Specifications for Protective Headgear for Vehicular Users,* ANSI Z90.1; American National Standards Institute, New York, NY 10018.
11. *Testing Physical Fitness;* Davis and Santa Maria. *Fire Command.* April 1975.
12. *Development of a Job-Related Physical Performance Examination for Fire Fighters;* Dotson and Others. A summary report for the National Fire Prevention and Control Adminstration. Washington, DC. March 1977.
13. *Proposed Sample Standards for Fire Fighters' Protective Clothing and Equipment;* International Association of Fire Fighters, Washington, DC.
14. *A Study of Facepiece Leakage of Self-Contained Breathing Apparatus by DOP Man Tests;* Los Alamos Scientific Laboratory, Los Alamos, NM.
15. *The Development of Criteria for Fire Fighters' Gloves; Vol.II: Glove Criteria and Test Methods;* National Institute for Occupational Safety and Health, Cincinnati, OH. 1976.
16. *Model Performance Criteria for Structural Fire Fighters' Helmets;* National Fire Prevention and Control Administration, Washington, DC. 1977.
17. *Firefighters;* Job Safety and Health Magazine, Occupational Safety and Health Administration, Washington, DC. June 1978,
18. *Eating Smoke—the Dispensable Diet;* Utech, H.P. The Fire Independent, 1975.
19. *Project Monoxide—A Medical Study of an Occupational Hazard of Fire Fighters;* International Association of Fire Fighters, Washington, DC.
20. *Occupational Exposures to Carbon Monoxide in Baltimore Firefighters;* Radford and Levine. Johns Hopkins University, Baltimore, MD. Journal of Occupational Medicine, September, 1976.
21. *Fire Brigades;* National Safety Council, Chicago, IL. 1966.
22. *American National Standard, Practice for Respiratory Protection for the Fire Service;* ANSI Z88.5; American National Standards Institute, New York, NY 10018.
23. *Respirator Studies for the Nuclear Regulatory Commission; October 1, 1977—September 30, 1978. Evaluation and Performance of Open Circuit Breathing Apparatus.* NU REG/CR-1235. Los Alamos Scientific Laboratory; Los Alamos, NM. 87545, January, 1980.

B. § *1910.157. Portable fire extinguishers:*

1. *Standard for Portable Fire Extinguishers,* ANSI/NFPA 10; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Methods for Hydrostatic Testing of Compressed Gas Cylinders,* C–1; Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
3. *Recommendations for the Disposition of Unserviceable Compressed Gas Cylinders,* C–2; Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
4. *Standard for Visual Inspection of Compressed Gas Cylinders,* C–6; Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
5. *Portable Fire Extinguisher Selection Guide,* National Association of Fire Equipment Distributors; 111 East Wacker Drive, Chicago, IL 60601.

C. § *1910.158. Standpipe and hose systems:*

1. *Standard for the Installation of Sprinkler Systems,* ANSI/NFPA 13; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Standard of the Installation of Standpipe and Hose Systems,* ANSI/NFPA 14; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Standard for the Installation of Centrifugal Fire Pumps,* ANSI/NFPA 20; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
4. *Standard for Water Tanks for Private Fire Protection,* ANSI/NFPA 22; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
5. *Standard for Screw Threads and Gaskets for Fire Hose Connections,* ANSI/NFPA 194; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
6. *Standard for Fire Hose,* NFPA 196; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
7. *Standard for the Care of Fire Hose,* NFPA 198; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

D. § *1910.159. Automatic sprinkler systems:*

1. *Standard of the Installation of Sprinkler Systems,* ANSI-NFPA 13; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Standard for the Care and Maintenance of Sprinkler Systems,* ANSI/NFPA 13A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Standard for the Installation of Standpipe and Hose Systems,* ANSI/NFPA 14; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
4. *Standard for the Installation of Centrifugal Fire Pumps,* ANSI/NFPA 20; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
5. *Standard for Water Tanks for Private Fire Protection,* ANSI-NFPA 22; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
6. *Standard for Indoor General Storage,* ANSI/NFPA 231; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
7. *Standard for Rack Storage of Materials,* ANSI/NFPA 231C; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

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E. § *1910.160. Fixed extinguishing systems—general information*:

1. *Standard for Foam Extinguishing Systems,* ANSI-NFPA 11; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Standard for Hi-Expansion Foam Systems,* ANSI/NFPA 11A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Standard on Synthetic Foam and Combined Agent Systems,* ANSI/NFPA 11B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
4. *Standard on Carbon Dioxide Extinguishing Systems,* ANSI/NFPA 12; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
5. *Standard on Halon 1301,* ANSI/NFPA 12A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
6. *Standard on Halon 1211,* ANSI/NFPA 12B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
7. *Standard for Water Spray Systems,* ANSI/NFPA 15; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
8. *Standard for Foam-Water Sprinkler Systems and Foam-Water Spray Systems,* ANSI/NFPA 16; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
9. *Standard for Dry Chemical Extinguishing Systems,* ANSI/NFPA 17; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

F. § *1910.161. Fixed extinguishing systems—dry chemical*:

1. *Standard for Dry Chemical Extinguishing Systems,* ANSI/NFPA 17; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *National Electrical Code,* ANSI/NFPA 70; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapor from Commercial Cooking Equipment,* NFPA 96; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

G. § *1910.162. Fixed extinguishing systems—gaseous agents:*

1. *Standard on Carbon Dioxide Extinguishing Systems,* ANSI/NFPA 12; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Standard on Halon 1301,* ANSI/NFPA 12B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Standard on Halon 1211,* ANSI/NFPA 12B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
4. *Standard on Explosion Prevention Systems,* ANSI/NFPA 69; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
5. *National Electrical Code,* ANSI/NFPA 70; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
6. *Standard on Automatic Fire Detectors,* ANSI/NFPA 72E; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
7. *Determination of Halon 1301/1211 Threshold Extinguishing Concentrations Using the Cup Burner Method;* Riley and Olson, Ansul Report AL–530–A.

H. § *1910.163. Fixed extinguishing systems—water spray and foam agents:*

1. *Standard for Foam Extinguisher Systems,* ANSI/NFPA 11; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Standard for High Expansion Foam Systems,* ANSI/NFPA 11A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Standard for Water Spray Fixed Systems for Fire Protection;* ANSI/NFPA 15; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
4. *Standard for the Installation of Foam-Water Sprinkler Systems and Foam-Water Spray Systems,* ANSI/NFPA 16; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

I. § *1910.164. Fire Detection systems:*

1. *National Electrical Code,* ANSI/NFPA 70; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Standard for Central Station Signaling Systems,* ANSI/NFPA 71; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Standard on Automatic Fire Detectors,* ANSI/NFPA 72E; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

J. § *1910.165. Employee alarm systems:*

1. *National Electrical Code,* ANSI/NFPA 70; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
2. *Standard for Central Station Signaling systems,* ANSI/NFPA 71; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
3. *Standard for Local Protective Signaling Systems,* ANSI/NFPA 72A; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
4. *Standard for Auxiliary Protective Signaling Systems,* ANSI/NFPA 72B; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
5. *Standard for Remote Station Protective Signaling Systems,* ANSI/NFPA 72C; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
6. *Standard for Proprietary Protective Signaling Systems,* ANSI/NFPA 72D; National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
7. *Vocal Emergency Alarms in Hospitals and Nursing Facilities: Practice and Potential.* National Bureau of Standards. Washington, D.C., July 1977.
8. *Fire Alarm and Communication Systems.* National Bureau of Standards. Washington, D.C., April 1978.

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APPENDIX D
AVAILABILITY OF PUBLICATIONS INCORPORATED IN SECTION 1910.156 FIRE BRIGADES

The final standard for fire brigades, Section 1910.156, contains provisions which incorporate certain publications by reference. The publications provide criteria and test methods for protective clothing worn by those fire brigade members who are expected to perform interior structural fire fighting. The standard references the publications as the chief sources of information for determining if the protective clothing affords the required level of protection.

It is appropriate to note that the final standard does not require employers to purchase a copy of the referenced publications. Instead, employers can specify (in purchase orders to the manufacturers) that the protective clothing meet the criteria and test methods contained in the referenced publications and can rely on the manufacturers' assurances of compliance. Employers, however, may desire to obtain a copy of the referenced publications for their own information.

The paragraph designation of the standard where the referenced publications appear, the title of the publications, and the availability of the publications are as follows:

Paragraph Designation	**Referenced Publication**	**Available From**
1910.156(e)(3)(ii)	"Protective Clothing for Structural Fire Fire Fighting," NFPA No. 1971 (1975)	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
1910.156(e)(4)(i)	"Development of Criteria for Fire Fighter's Gloves; Vol II, Part II: Test Methods," (1976)	U.S. Government Printing Office Washington, D.C. 20402 Stock No. for Vol II is: 071-033-0201-1
1910.156(e)(5)(i)	"Model Performance Criteria for Structural Firefighter's Helmets," (1977)	U.S. Fire Administration National Fire Safety and Research Office Washington, D.C. 20330

The referenced publications (or a microfiche of the publications) are available for review at many universities and public libraries throughout the country. These publications may also be examined at the OSHA Technical Data Center, Room N2439-Rear, United States Department of Labor, 200 Constitution Avenue, N.W., Washington, D.C. 20210 (202/523-9700), or at any OSHA Regional Office (see telephone directories under United States Government-Labor Department).

APPENDIX E
TEST METHODS FOR PROTECTIVE CLOTHING
(MANDATORY AS REFERENCES IN 1910.156 FIRE BRIGADES)

This appendix contains test methods which must be used to determine if protective clothing affords the required level of protection as specified in 1910.156, fire brigades.

(1) *Puncture resistance test method for foot protection.*

a. *Apparatus.* The puncture resistance test shall be performed on a testing machine having a movable platform adjusted to travel at ¼ inch/min. (.01 cm/sec.). Two blocks of hardwood, metal, or plastic shall be prepared as follows: the blocks shall be of such size and thickness as to insure a suitable rigid test ensemble and allow for at least one-inch of the pointed end of an 8D common nail firmly at an angle of 98°. The second block shall have a maximum ½ inch (1.3 cm) diameter hole drilled through it so that the hole will allow free passage of the nail after it penetrates the insole during the test.

B. *Procedure.* The test ensemble consisting of the sample unit, the two prepared blocks, a piece of leather outsole 10 to 11 irons thick, and a new 8D nail in the hole, shall be placed as follows: the 8D nail in the hole, the sample of outsole stock superimposed above the nail, the area of the sole plate in that order. The machine shall be started and the pressure, in pounds required for the nail to completely penetrate the outsole and sole plate, recorded to the nearest five pounds. Two determinations shall be made on each sole plate and the results averaged. A new nail shall be used for each determination.

C. *Source.* These test requirements are contained in ''Military Specification For Fireman's Boots,'' MIL-B-2885D (1973 and amendment dated 1975) and are reproduced for your convenience.

(2) *Test method for determining the strength of cloth by tearing: Trapezoid Method.*

A. *Test specimen.* The specimen shall be a rectangle of cloth 3-inches by 6-inches (7.6 cm by 15.2 cm). The long dimension shall be parallel to the warp for warp tests and parallel to the filling for filling tests. No two specimens for warp tests shall contain the same warp yarns, nor shall any two specimens for filling tests contain the same filling yarns. The specimen shall be taken no nearer the selvage than 1/10 the width of the cloth. an isosceles trapeziod having an altitude of 3 inches (7.6 cm) and bases of 1 inch (2.5 cm) and 4 inches (10.2 cm) in length, respectively, shall be marked on each specimen, preferably with the aid of a template. A cut approximately ⅜ inch (1 cm) in length shall then be made in the center of a perpendicular to the 1-inch (2.5 cm) edge.

B. *Apparatus.* (i) Six-ounce (.17kg) weight tension clamps shall be used so designed that the six ounces (.17 kg) of weight are distributed evenly across the complete width of the sample.

(ii) The machine shall consist of three main parts: Straining mechanism, clamps for holding specimen, and load and elongation recording mechanisms.

(iii) A machine wherein the specimen is held between two clamps and strained by a uniform movement of the pulling clamp shall be used.

(iv) The machine shall be adjusted so that the pulling clamp shall be used.

(iv) The machine shall be adjusted so that the pulling clamp shall have a uniform speed of 12 ± 0.5 inches/min (0.5 ± .02 cm/sec).

(v) The machine shall have two clamps with two jaws on each clamp. the design of the two clamps shall be such that one gripping surface or jaw may be an intregal part of the rigid frame of the clamp or be fastened to allow a slight vertical movement, while the other gripping surface or jaw shall be completely moveable. The dimension of the immovable jaw of each clamp parallel to the application of the load shall measure three inches or more. The face of the movable jaw of each clamp shall measure one-inch by three inches.

Each jaw face shall have a flat smooth, gripping surface. All edges which might cause a cutting action shall be rounded to a radius of not over 1/64-inch (.04 cm). In cases where a cloth tends to slip when being tested, the jaws may be faced with rubber or other material to prevent slippage. The distance between the jaws (gage length) shall be one-inch at the start of the test.

(vi) Calibrated dial; scale or chart shall be used to indicate applied load and elongation. The machine shall be adjusted or set, so that the maximum load required to break the specimen has ruptured.

(vii) The machine shall be of such capacity that the maximum load required to break the specimen shall not be greater than 85 percent or less than 15 percent of the rated capacity.

(viii) The error of the machine shall not exceed 2 percent up to and including a 50-pound (22.6 kg) load and 1 percent over a 50-pound (22.6 kg) load at any reading within its loading range.

(ix) All machine attachments for determining maximum loads shall be disengaged during this test.

C. *Procedure.* (i) The specimen shall be clamped in the machine along the nonparallel sides of the trapezoid so that these sides lie along the lower edge of the upper clamp and the upper edge of the lower clamp with the cut halfway between the clamps. The short trapeziod base shall be held taut and the long trapeziod base shall lie in the folds.

(ii) The machine shall be started and the force necessary to tear the cloth shall be observed by means of an autographic recording device. The speed of the pulling clamp shall be 12 inches ± 0.5 inches/min (0.5 ± .02 cm/sec).

(iii) If a specimen slips between the jaws, breaks in or at the edges of the jaws, or if for any reason attributable to faulty technique, an individual measurement falls markedly below the average test results for the sample unit, such result shall be discarded and another specimen shall be tested.

(iv) The tearing strength of the specimen shall be the average of the five highest peak loads of resistance registered for 3 inches (7.6 cm) of separation of the tear.

D. *Report.* (i) Five specimens in each of the warp and filling directions shall be tested from each sample unit.

(ii) The tearing strength of the sample unit shall be the average of the results obtained from the specimens tested in each of the warp and filling directions and shall be reported spearately to the nearest 0.1-pound (.05 kg).

E. *Source.* These test requirements are contained in ''Federal Test Method Standard 191, Method 5136'' and are reproduced for your convenience.

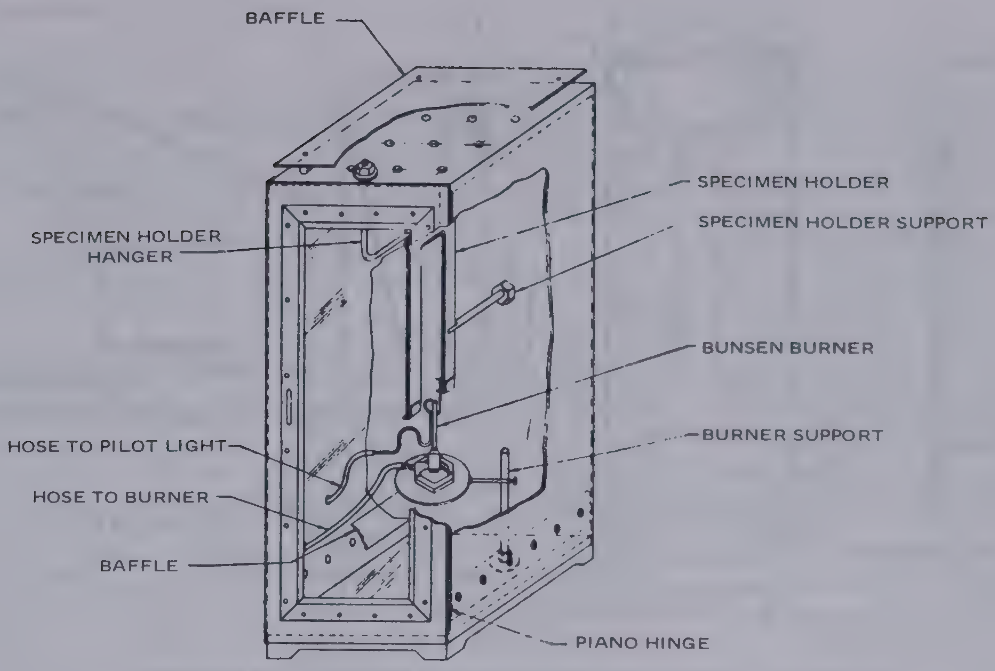


FIGURE L-1 – Vertical flame resistance textile apparatus.

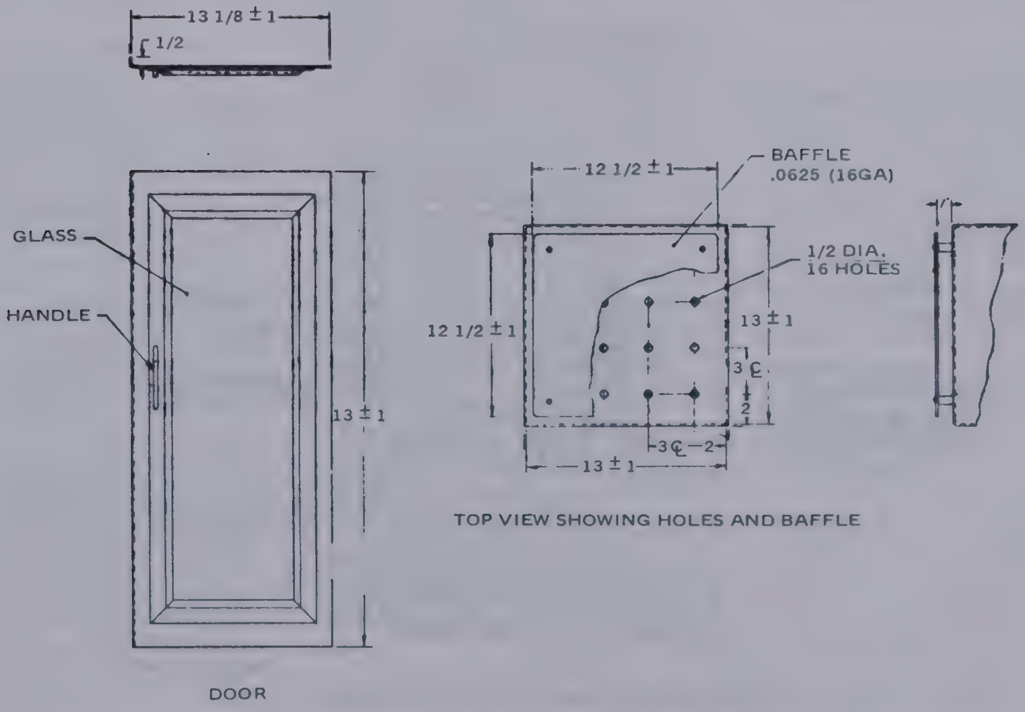
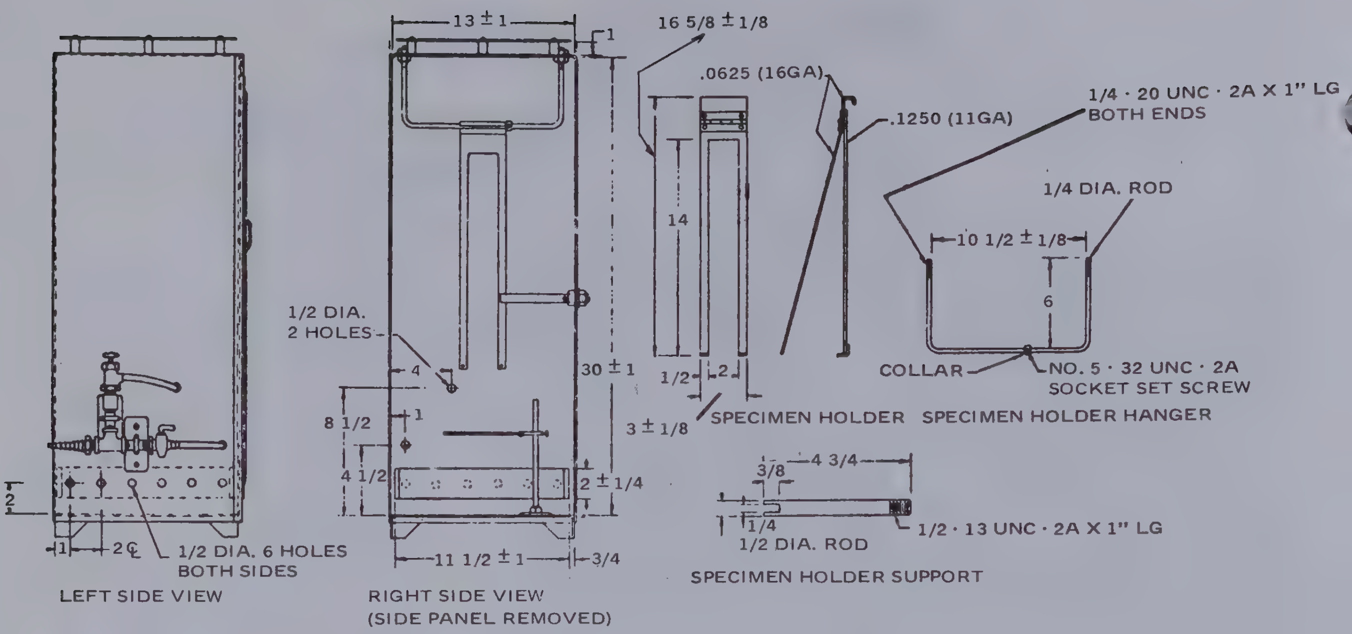


FIGURE L-2 – Vertical flame resistance textile apparatus, door and top view w/baffle. All given dimensions are in inches. System International (S.I.) Unit: 1 inch = 2.54



LEFT SIDE VIEW

RIGHT SIDE VIEW
(SIDE PANEL REMOVED)

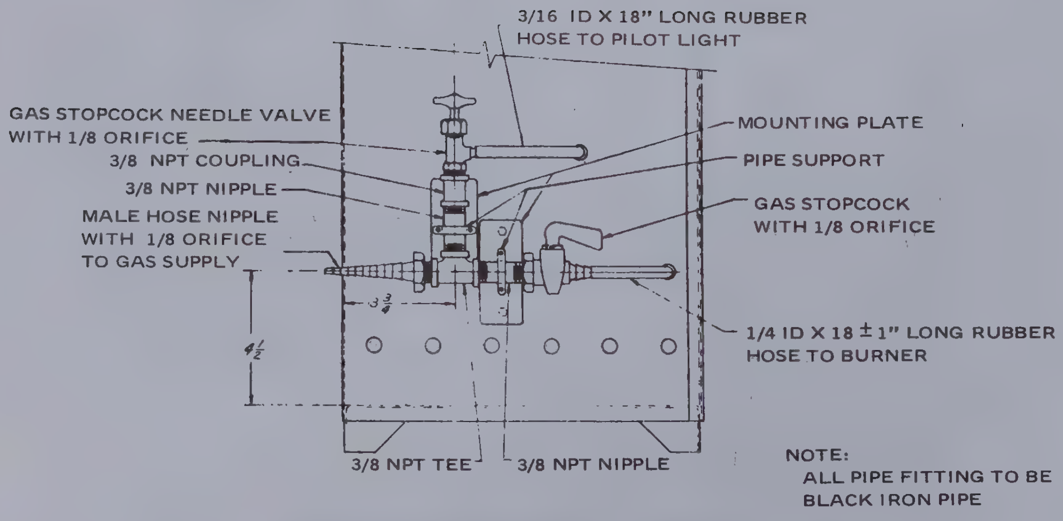
SPECIMEN HOLDER

SPECIMEN HOLDER HANGER

SPECIMEN HOLDER SUPPORT

FIGURE L-3 – Vertical flame resistance textile apparatus, views and details.

All given dimensions are in inches. System International (S.I.) Unit: 1 inch = 2.54



SIDE VIEW SHOWING GAS HOSE CONNECTION

FIGURE L-4 – Vertical flame resistance textile apparatus.

All given dimensions are in inches. System International (S.I.) Unit : 1 inch = 2.54

(3) *Test method for determining flame resistance of cloth; vertical.*

A. *Test specimen.* The specimen shall be a rectangle of cloth 2¾ inches (7.0 cm) by 12 inches (30.5 cm) with the long dimension parallel to either the warp or filling direction of the cloth. No two warp yearns, and no two filling specimens shall contain the same filling yarn.

B. *Number of determinations.* Five specimens form each of the warp and filling directions shall be tested from each sample unit.

C. *Apparatus.* (i) Cabinet. A cabinet and accessories shall be fabricated in accordance with the requirements specified in Figures L-1, L-2, and L-3. Galvanized sheet metal or other suitable metal shall be used. The entire inside back wall of the cabinet shall be painted black to facilitate the viewing of the test specimen and pilot flame.

(ii) Burner. The burner shall be equipped with a variable orifice to adjust the flame height, a barrel having a ⅜-inch (1 cm) inside diameter and a pilot light.

(a) The burner may be constructed by combining a ⅜-inch (1 cm) inside diameter barrel 3½ inches (7.6 ± .6 cm) long from a fixed orifice burner.

(b) The pilot light tube shall have a diameter of approximately 1/16-inch (.2 cm) and shall be spaced ⅛-inch (.3 cm) away from the burner edge with a pilot flame ⅛-inch (.3 cm) long.

(c) The necessary gas connections and the applicable plumbing shall be as specified in Figure L-4 except that a solenoid valve may be used in lieu of the stopcock valve or solenoid valve, whichever is used, shall be capable of being fully opened or fully closed on 0.1 second.

(d) On the side of the barrel of the burner, opposite the pilot light there shall be a metal rod of approximately ⅛-inch (.3 cm) diameter spaced ½-inch (1.3 cm) from the barrel and extending above the burner. The rod shall have two 5/16-inch (.8 cm) prongs marking the distances of ¾-inch (1.9 cm) and 1½ inches (3.8 cm) above the top of the burner.

(e) The burner shall be fixed in a position so that the center of the barrel of the burner is directly below the center of the specimen.

(iii) There shall be a control valve system with a delivery rate designed to furnish gas to the burner under a pressure of 2½ ± ¼ pounds per square inch (PSI) (17.5 ± 1.8 k Pa) at the burner inlet (see (g)(3)(vi)(A)). The manufacturer's recommended delivery rate for the valve system shall be included in the required pressure.

(iv) A synthetic gas mixture shall be of the following composition within the following limits (analyzed at standard conditions): 55 ± 3 percent hydrogen, 24 ± 1 percent methane, 3 ± 1 percent ethane, and 18 ± 1 percent carbon monoxide which will give a specific gravity of 0.365 ± 0.018 (air = 1) and a B.T.U. contents of 540 ± 20 per cubic foot (20.1 ± 3.7 KJ/L) (dry basis) at 69.8°F (21° C).

(v) there shall be metal hooks and weights to produce a series of total loads to determine length of char. The metal hooks shall consist of No. 19 gage steel wire or equivalent and shall be made from 3-inch (7.6 cm) lengths of wire and bent ½-inch (1.3 cm) from one end to a 45 degree hook. One end of the hook shall be fastened around the neck of the weight to be used.

(vi) There shall be a stop watch or other device to measure the burning time to 0.2-second.

(vii) There shall be a scale, graduated in 0.1-inch (.3 cm) to measure the length of the char.

D. *Procedure.* (i) The material undergoing test shall be evaluated for the characteristics of after-flame time and char length on each specimen.

(ii) All specimens to be tested shall be at moisture equilibrium under standard atmospheric conditions in accordance with paragraph (3)C of this appendix. Each specimen to be tested shall be exposed to the test flame within 20 seconds after removal from the standard atmosphere. In case of dispute, all testing will be conducted under Standard Atmospheric Conditions in accordance with paragraph (3)C of this appendix.

(iii) The specimen in its holder shall be suspended vertically in the cabinet in such a manner that the entire length of the specimen is exposed and the lower end is ¾-inch (1.9 cm) above the top of the gas burner. The apparatus shall be set up in a draft free area.

(iv) Prior to inserting the specimen, the pilot flame shall be adjusted to approximately ⅛-inch (.3 cm) in height measured from its lowest point to the tip.

The burner flame shall be adjusted by means of the needle valve in the base of the burner to give a flame height of 1½ inches (3.8 cm) with the stopcock fully open and the air supply to the burner shut off and taped. The 1½-inch (3.8 cm) flame height is obtained by adjusting the valve so that the uppermost portion (tip) of the flame is level with the tip of the metal prong (see figure L-2) specified for adjustment of flame height. It is an important aspect of the evaluation that the flame height be adjusted with the tip of the flame level with the tip of the metal prong. After inserting the specimen, the stopcock shall be fully opened, and the burner flame applied vertically at the middle of the lower edge of the specimen for 12 seconds and the burner turned off. The cabinet door shall remain shut during testing.

(v) The after-flame shall be the time the specimen continues to flame after the burner flame is shut off.

(vi) After each specimen is removed, the test cabinet shall be cleared of fumes and smoke prior to testing the next specimen.

(vii) After both flaming and glowing have ceased, the char length shall be measured. The char length shall be the distance from the end of the specimen, which was exposed to the flame, to the end of a tear (made lengthwise) of the specimen through the center of the charred area as follows: The specimen shall be folded lengthwise and creased by hand along a line through the highest peak of the charred area. The hook shall be inserted in the specimen (or a hole, ¼-inch (.6 cm) diameter or less, punched out for the hook) at one side of the charred area ¼-inch (.6 cm) from the lower end. A weight of sufficient size such that the weight and hook together shall equal the total tearing load required in Table L-2 of this section shall be attached to the hook.

(viii) A tearing force shall be applied gently to the specimen by grasping the corner of the cloth at the opposite edge of the char from the load and raising the specimen and weight clear of the supporting surface. The end of the tear shall be marked off on the edge and the char length measurement made along the undamaged edge.

Loads for determining char length applicable to the weight of the test cloth shall be shown in Table L-2.

Table L-2*

Specified weight per square yard of cloth before any fire retardant treatment or coating—ounces	Total tearing weight for determining the charred length—pound
2.0 to 6.0	0.25
Over 6.0 to 15.0	0.50
Over 15.0 to 23.0	0.75
Over 23.0	1.0

(ix) The after-flame time of the specimen shall be recorded to the nearest 0.2-second and the char length to the nearest 0.1-inch (.3 cm).

E. *Report.* (i) the after-flame time and char length of the sample unit shall be the average of the results obtained from the individual specimens tested. All values obtained from the individual specimens shall be recorded.

(ii) The after-flame time shall be reported to the nearest 0.2-second and the char length to the nearest 0.1-inch (.3 cm).

F. *Source.* These test requirements are contained in "Federal Test Method Standard 191, Method 5903 (1971)" and are reproduced for your convenience.

* To change into System International (S.I.) units,
1 ounce = 28.35 grams,
1 pound = 453 grams,
1 yard = .91 metre.

OVERVIEW: SUBPART M

COMPRESSED GAS AND COMPRESSED AIR EQUIPMENT

On February 10, 1984, OSHA removed the standards on compressed gases from Subpart M, claiming they duplicate the requirements of 1910.101 in Subpart H. These sections have been retained in the OSHA Reference Manual for advisory purposes only:

Std. No. **Page No.**

1910.166 **Inspection of compressed gas cylinders** .... (M-01)

1910.167 **Safety relief devices for compressed gas cylinders** .... (M-03)

1910.168 **Safety relief devices for cargo and portable tanks storing compressed gases** .... (M-03)

The remainder of Subpart M applies to compressed air receivers and the use of compressed air for cleaning, drilling, chipping, hoisting, etc. Requirements for the construction, installation, maintenance, and safety devices for compressed air equipment are outlined. However, this section does not apply to: compressed air used to convey materials; compressed air work environments in tunnels, caissons, etc.; or compressed air machinery used on transportation vehicles (automotive equipment, steam or electric railway cars, etc.).

Std. No. **Page No.**

1910.169 **Air receivers** .... (M-05)

DEFINITIONS — SUBPART M (Advisory Only)

Approach channel. The passage or passages through which gas must pass from the cylinder to reach the operating parts of the safety relief device.

Cargo tank. Any container designed to be permanently attached to any motor vehicle or other highway vehicle in which is to be transported any compressed gas. The term "cargo tank" shall not be construed to include any tank used solely for the purpose of supplying fuel for propulsion of the vehicle or containers fabricated under specifications for cylinders.

Code. Paragraph U-68, U-69, U-200 or U-201 of section VIII of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers, 1949 Edition; or section VIII of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers, 1950, 1952, 1956, 1959, and 1962 Editions; or The Code for Unfired Pressure Vessels for Petroleum Liquids and Gases of the American Petroleum Institute and the American Society of Mechanical Engineers (API-ASME), 1951 Edition.

Combination frangible disc-fusible plug. A frangible disc in combination with a low melting point fusible metal, intended to prevent its bursting at its predetermined bursting pressure unless the temperature also is high enough to cause yielding or melting of the fusible metal.

Combination safety relief valve and fusible plug. A safety relief device utilizing a safety relief valve in combination with a fusible plug. This combination device may be an integral unit or separate units and is intended to open and to close at predetermined pressures or to open at a predetermined temperature.

Compressed gas in solution. A nonliquefied gas which is dissolved in a solvent. (For example: acetylene.)

Discharge channel. The passage or passages beyond the operating parts through which gas must pass to reach the atmosphere exclusive of any piping attached to the outlet of the device.

DOT design pressure. The "maximum allowable working pressure" as used in the "Code." This is the maximum gage pressure at the top of the tank in its operating position. To determine the minimum permissable thickness of physical characteristics of the different parts of the vessel, the static head of the lading shall be added to the DOT design pressure to determine the thickness of any specific part of the vessel. If vacuum insulation is used, the liquid container shall be designed for a pressure of 15 p.s.i. more than DOT design pressure, plus static head of the lading.

Exception: For containers constructed in accordance with paragraph U-68 or U-69 of section VIII of the ASME Boiler and Pressure Vessel Code, 1949 Edition, the maximum allowable working pressure for the purpose of these standards is considered to be 125% of the design pressure as provided in 49 CFR 173.315 of DOT Regulations.

DOT regulations. The U.S. Department of Transportation Regulations for Transportation of Explosives and Other Dangerous Articles by Land and Water in Rail Freight, Express and Baggage Services and by Motor Vehicle (Highway) and Water, including Specifications for Shipping Containers, 49 CFR 171-178.

Flow capacity. The capacity in cubic feet per minute of free air discharged at the required flow rating pressure.

Flow rating pressure. The pressure at which a safety relief device is rated for capacity.

Frangible disc. An operating part in the form of a disc, usually of metal and which is so held as to close the safety relief device channel under normal conditions. The disc is intended to burst at a predetermined pressure to permit the escape of gas.

Free air or free gas. Air or gas measured at a pressure of 14.7 pounds per square inch absolute and a temperature of 60gF.

Fusible plug. An operating part in the form of a plug of suitable low melting material, usually a metal alloy, which closes the safety relief device channel under normal condition and is intended to yield or melt at a predetermined temperature to permit the escape of gas.

Liquefied compressed gas. A gas which, under the charging pressure, is partially liquid at a temperature of 70°F. A flammable compressed gas which is normally nonliquefied at 70°F. but which is partially liquid under the charging pressure and temperature, shall follow the requirements for liquefied compressed gases.

Nonliquefied compressed gas. A gas, other than a gas in solution which under the charging pressure, is entirely gaseous at a temperature of 70°F.

Operating part. The part of a safety relief device that normally closes the safety discharge channel but when moved from this position as a result of the action of heat or pressure, or a combination of the two, permits escape of gas from the cylinder.

Portable tank. Any container designed primarily to be temporarily attached to a motor vehicle, other vehicle, railroad car other than tank car, or marine vessel, and equipped with skids, mountings, or accessories to facilitate handling of the container by mechanical means, in which is to be transported any compressed gas. The term "portable tank" shall not be construed to include any cargo tank, any tank car tank, or any tank of the DOT-106A and DOT-110A-W type.

Pressure opening. The orifice against which the frangible disc functions.

Pressurized liquid compressed gas. A compressed gas other than a compressed gas in solution, which cannot be liquefied at a temperature of 70°F., and which is maintained in the liquid state at a pressure not less than 40 p.s.i.a. by maintaining the gas at a temperature less than 70°F.

Rated bursting pressure. The maximum pressure for which a frangible disc is designed to burst when in contact with the pressure opening for which it was designed when tested.

Reinforced fusible plug. Consists of a core of suitable material having a comparatively high yeld temperature surrounded by a low-melting point fusible metal of the required yield temperature.

Resealing pressure. The pressure at which leakage ceases through a water seal of not over 4 inches on the outlet of the valve.

Safety relief device. A device intended to prevent rupture of a cylinder under certain conditions of exposures.

Safety relief device channel. The channel through which gas released by operation of the device must pass from the cylinder to the atmosphere exclusive of any piping attached to the inlet or outlet of the device.

Safety refief valve. A safety relief device containing an operating part that is held normally in a position closing the safety relief device channel by spring force and is intended to open and to close at predetermined pressures.

Set pressure. The pressure marked on the valve and at which it is set to start-to-discharge.

Start-to-discharge pressure. The pressure at which the first bubble appears through a water seal of not over 4 inches on the outlet of the safety relief valve.

Note: When the nature of the service requires the use of a metal-to-metal seat safety relief value, with or without secondary sealing means, the start-to-discharge pressure may be considered the pressure at which an audible discharge occurs.

Test pressure of the cylinder. The minimum pressure at which a cylinder must be tested as prescribed in DOT specifications for compressed gas cylinders 41 CFR Ch. I.

Yield temperature. The temperature at which the fusible metal or alloy of a fusible plug will yield when tested.

1910.166 — Reserved

Note: On February 10, 1984, OSHA removed the standard covering Inspection of Compressed Gas Cylinders. For advisory reasons only, we are retaining the items below as an aid to subscribers who may wish to use the information in their programs.

YES NO

(b) General Requirements.

Application. (b)(1)

Are precautions taken to insure that compressed gas cylinders are in a safe condition to the extent that this can be determined by visual and other inspection required by this subparagraph? (b)(1)(i)

These requirements **do not** apply to cylinders manufactured under specification DOT (ICC)-3HT (49 CFR Ch. 1). (b)(1)(ii)

Quality of Inspection. (b)(2)

Where experienced personnel are not available for the inspection of cylinders, do users of cylinders return them to a manufacturer for reinspection? (b)(2)

(c) Inspection of Low-Pressure Cylinders Exempt From the Hydrostatic Test Including Acetylene Cylinders.

Application. (c)(1)

The following items apply to cylinders of the type that are exempt from the hydrostatic retest requirements of the DOT, by virtue of their exclusive use in certain noncorrosive gas service. (c)(1)

Preparation for Inspection. (c)(2)

Is rust, scale, caked paint, etc., removed from the exterior surface so that the surface can be adequately observed? (c)(2)

Are facilities provided for inverting the cylinder to facilitate inspection of the bottom? (c)(2)

Exterior Inspection. (c)(3)

Are cylinders checked as outlined below for corrosion, general distortion, or any other defect that might indicate a weakness which would render it unfit for service? (c)(3)

Do cylinders meet the requirements of the following items? (c)(3)(i)

(a) Is a cylinder rejected when the tareweight is less than 95 percent of the original tareweight as marked on the cylinder?
Is the tareweight determined when the cylinder is empty?
(b) Is a cylinder rejected when the remaining wall in an area having isolated pitting only is less than one-third of the minimum allowable wall thickness as determined in the items under (ii), (iii) or (iv) of this subparagraph which follows in the normal sequence?
(c) Is a cylinder rejected when line corrosion on the cylinder is 3 inches in length or over and the remaining wall is less than three-fourths of the minimum allowable wall thickness, or when line corrosion is less than 3 inches in length and the remaining wall thickness is less than one-half the minimum allowable wall thickness, as determined in the items under (ii), (iii), or (iv) of this subparagraph which follows in the normal sequence?
(d) Is a cylinder rejected when the remaining wall in an area of general corrosion is less than one-half of the minimum allowable wall thickness as determined in the items under (ii), (iii), or (iv) of this subparagraph? (c)(3)(i)

Is the original wall thickness of the cylinder known so that the items under subdivision (i) above can be determined? (c)(3)(ii)

1910.166 — INSPECTION OF COMPRESSED GAS CYLINDERS

(c) Inspection of Low-Pressure Cylinders Exempt From the Hydrostatic Test Including Acetylene Cylinders.

YES NO

Table M-1 (see Appendix) lists the minimum allowable wall thickness under DOT specifications (49 CFR Ch. 1) for a number of common size low-pressure cylinders. (c)(3)(ii)

When the wall thickness of the cylinder at manufacture is not known, and the actual wall thickness cannot be measured, is the cylinder rejected when the inspection reveals that the deepest pit in a general corrosion area exceeds three sixty-fourths inch? (c)(3)(iii)

When the original wall thickness at manufacture is known, or the actual wall thickness is measured, is the cylinder rejected if one and one-half times the measured pit depth leaves less than 0.064 inch of wall thickness? (c)(3)(iv)

Is special attention given to dents where the metal deformation is sharp and confined, or where they are near a weld? (c)(3)(v)

Are cylinders rejected where the denting includes any part of a weld, if the maximum allowable dent exceeds one-fourth inch? (c)(3)(vi)

Is the cylinder rejected if the denting occurs where the deformation does not include a weld, if the depth of the dent is greater than one-tenth of the mean diameter of the dent? (c)(3)(vii)

Are the depth limits of cuts, gouges, or digs met, as set forth in the following two items? (c)(3)(viii)

Are cylinders rejected whenever the length of the cuts, gouges, or digs is 3 inches or more?

(a) When the original wall thickness at manufacture is not known, and the actual wall thickness cannot be measured, is a cylinder rejected if the cut, gouge, or dig exceeds one-half of the minimum allowable wall thickness as determined under the items in (ii), (iii), or (iv) above?
(b) When the original wall thickness at manufacture is known, or the actual wall thickness is measured, is a cylinder rejected if the original wall thickness minus the depth of the defect is less than one-half of the minimum allowable wall thickness as determined under (ii), (iii), or (iv) above? (c)(3)(viii)

Is a cylinder charged and carefully examined for leaks? (c)(3)(ix)(a)

Are seams and pressure openings coated with a soap or other suitable solution to detect the escape of gas? (c)(3)(ix)(a)

Are cylinders rejected if any leaks occur? (c)(3)(ix)(a)

Are safety relief devices that are intended to prevent rupture of a cylinder under certain conditions of exposure tested for leaks before a charged cylinder is shipped from the cylinder filling plant? (c)(3)(ix)(b)

Are cylinders carefully inspected for evidence of exposure to fire after fire damage? (c)(3)(x)

Are the following evidences of exposure checked to determine fire damage?

(1) Charring or burning of the paint or other protective coat;
(2) Burning or sintering of the metal;
(3) Distortion of the cylinder;
(4) Melted out fuse plugs;
(5) Burning or melting of valve? (c)(3)(x)(a)

1910.166 – INSPECTION OF COMPRESSED GAS CYLINDERS

(c) Inspection of Low-Pressure Cylinders Exempt From the Hydrostatic Test Including Acetylene Cylinders.

	YES	NO
Are all cylinders removed from service which have been subjected to the action of fire? (c)(3)(x)(b)		
Are cylinders which have definite visible bulges removed from service and evaluated? (c)(3)(xi)		
Are cylinders rejected when a variation of 1 percent or more is found in the measured circumferences or in peripheral distances measured from the valve spud to the center seam (or equivalent fixed point)? (c)(3)(xi)		
Are cylinder necks examined for serious cracks, folds, and flaws? (c)(3)(xii)		
Are cylinder neck threads examined whenever the valve is removed from the cylinder? (c)(3)(xiii)		
Are cylinders rejected if the required number of effective threads are materially reduced, or if a gastight seal cannot be obtained by reasonable valving methods? (c)(3)(xiii)		
Are gages used to measure the number of effective threads? (c)(3)(xiii)		
Is the cylinder rejected if the valve is noticeably tilted? (c)(3)(xiv)		
Are cylinders rejected if the footring and headring are so distorted that they no longer perform their functions as follows: *(a)* To cause the cylinder not to remain upright, and stable, and *(b)* To protect the valve. (c)(3)(xv)		
Are rings examined for distortion for looseness, and for failure of welds? (c)(3)(xv)		
(d) Low-pressure Cylinders Subject to Hydrostatic Testing.		
Application. (d)(1)		
The following items apply to low-pressure cylinders other than those covered in the items under paragraph (c) of this section. Defect limits for the external examination are required as provided for in items under paragraph (c) of this section, with the exception of aluminum cylinders which must comply with the items under (d)(4) of this paragraph. (d)(1)		
Preparation for Inspection. (d)(2)		
Are flammable gas cylinders purged before being examined with a light? (d)(2)		
Are lamps used for flammable gas cylinder inspection explosion proof? (d)(2)		
Internal Inspection. (d)(3)		
Are cylinders inspected internally at least every time the cylinder is periodically retested? (d)(3)		
Is the examination made with a light of sufficient intensity to clearly illuminate the interior walls? (d)(3)		
External Inspection of Aluminum Cylinders. (d)(4)		
Are the items under paragraph (c) complied with in the external inspection of aluminum cylinders, except as follows? (d)(4)		
Are aluminum cylinders rejected when impairment to the surface exceeds a depth where the remaining wall is less than three-fourths of the minimum allowable wall thickness required by the specification under which the cylinder was manufactured? (d)(4)(i)		

1910.166 – INSPECTION OF COMPRESSED GAS CYLINDERS

(d) Low-pressure Cylinders Subject to Hydrostatic Testing.

	YES	NO
Are aluminum cylinders, which are subjected to the action of fire, removed from service? (d)(4)(ii)		
(e) High-Pressure Cylinders.		
Application. (e)(1)		
The following items apply to high-pressure cylinders with a marked service pressure of 900 p.s.i. or higher. (e)(1)		
Preparation for Inspection. (e)(2)		
Are cylinders cleaned for inspection so that the inside and outside surfaces and all conditions can be observed? (e)(2)(i)		
Does this include removal of scale and caked paint from the exterior and the thorough removal of internal scale? (e)(2)(i)		
On cylinders with interior coating, is the interior coating examined for defects? (e)(2)(i)		
If the coating is defective, is it removed? (e)(2)(i)		
Is a good inspection light of sufficient intensity to clearly illuminate the interior wall used for internal inspection? (e)(2)(ii)		
Are flammable gas cylinders purged before being examined with a light? (e)(2)(ii)		
Are lamps for flammable gas cylinder inspection of the explosion proof type? (e)(2)(ii)		
Exterior Inspection. (e)(3)		
When the original wall thickness of the cylinder is not known, and the actual wall thickness cannot be measured, is the cylinder rejected if corrosion exceeds one thirty-second inch in depth? (e)(3)(ii)		
When the wall thickness is known, or the actual wall thickness is measured, are cylinders rejected when the defect is more than one-sixteenth of an inch? (e)(3)(iii)		
Are cylinders with general corrosion evaluated by subjecting them to a hydrostatic test? (e)(3)(iv)		
Are such cylinders rejected if they show an elastic expansion of 227 cc. or greater? (e)(3)(iv)		
Is the cylinder rejected when the maximum corrosion limit is one thirty-second inch when the wall is not known? (e)(3)(iv)		
After any repair operation involving removal of any defects of appreciable depth having a sharp bottom, is a verification of the cylinder strength and structure made by a hydrostatic test or other suitable means? (e)(3)(v)		
Are cylinders with dents with a depth of about one-sixteenth inch rejected, when the major diameter of the dent is equal to or greater than 32 times the depth of the dent? (e)(3)(vi)		
Are cylinders with arc or torch burns removed from service? (e)(3)(vii)		
Are cylinders with distinct visual bulges removed from service until the nature of the defect is determined? (e)(3)(viii)		
Are cylinders carefully inspected for evidences of exposure to fire? (e)(3)(ix)		
Are cylinder necks examined for serious cracks, folds, and flaws? (e)(3)(x)		

1910.166 – INSPECTION OF COMPRESSED GAS CYLINDERS

(f) Internal Inspection.

YES NO

(f) Internal Inspection.

Are cylinders inspected internally at least every time the cylinder is periodically retested? (f)(1)

Is this examination made with a light of sufficient intensity to clearly illuminate the interior walls? (f)(1)

1910.167 — Reserved

Note: On February 10, 1984, OSHA removed the standard covering Safety Relief Devices for Compressed Gas Cylinders. For advisory reasons only, we are retaining the items below as an aid to subscribers who may wish to use the information in their programs.

(b) General Requirements.

Application. (b)(1)

Do compressed gas cylinders, portable tanks, and cargo tanks have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda, and S-1.2-1963? (b)(1)

Types of Safety Relief Devices. (b)(2)

Are safety relief devices as covered by this section designated as follows:

(i) Type CG-1: Frangible disc;
(ii) Type CG-2: Fusible plug or reinforced fusible plug utilizing a fusible alloy with yield temperature not over 170°F., nor less than 157°F.;
(iii) Type CG-3: Fusible plug or reinforced fusible alloy with yield temperature not over 220°F., nor less than 208°F.;
(iv) Type CG-4: Combination frangible disc-fusible plug, utilizing a fusible alloy with yield temperature not over 170°F. nor less than 157°F.;
(v) Type CG-5: Combination frangible disc-fusible plug, utilizing a fusible alloy with yield temperature not over 220°F. nor less than 208°F.;
(vi) Type CG-7: Safety relief valve;
(vii) Type CG-8: Combination safety relief valve and fusible plug. (b)(2)

Specifications and Tests. (b)(3)

Do all safety relief devices covered by this section meet the design, construction, marking and test specification of the Compressed Gas Association Safety Relief Device Standards Part 1 - Cylinders for Compressed Gases: S1.1-1963? (b)(3)

Specific Requirements for Safety Relief Devices. (b)(4)

Are compressed gas cylinders, which under the DOT regulations must be equipped with safety relief devices, so equipped with devices of proper construction, location, and discharge capacity under the conditions prescribed in Table 1 of the Compressed Gas Associations Std S-1.1-1963? (b)(4)(i)

Are only replacement parts or assemblies provided by the manufacturer used? (b)(4)(ii)

When a frangible disc is used with a compressed gas cylinder, does the rated bursting pressure of the disc not exceed the minimum required test pressure of the cylinder with which the device is used? (b)(4)(iii)

Exception: Except for DOT-3E cylinders, the rated bursting pressure of the device shall not exceed 4,500 pounds p.s.i.g.

1910.167 – SAFETY RELIEF DEVICES FOR COMPRESSED GAS CYLINDERS

(b) General Requirements.

YES NO

When a safety relief valve is used on a compressed gas cylinder, does the flow rating pressure not exceed the minimum required test pressure of the cylinder on which the safety relief valve is installed? (b)(4)(iv)

Is the reseating pressure not less than the pressure in a normally charged cylinder at 130°F.? (b)(4)(iv)

When fittings and piping are used on either the upstream or downstream side or both of a safety relief device or devices, is the passage so designed that the flow capacity of the safety relief device will not be reduced below the capacity required for the container on which the safety relief device assembly is installed? (b)(4)(v)

Are precautions taken to insure that fittings, piping, and method of attachment will not impair the operation of the device? (b)(4)(v)

Are fittings, piping, and method of attachment designed to withstand normal handling and the pressures developed when the device, or devices, function? (b)(4)(v)

Are precautions taken to insure that no shutoff valve will be installed between the safety relief devices and the cylinder? (b)(4)(vi)

Maintenance Requirements for Safety Relief Devices. (b)(5)

In order to keep cylinder safety relief devices in reliable operating condition, is care taken in the handling or storing of compressed gas cylinders to avoid damage? (b)(5)(i)

Is care also exercised to avoid plugging by paint or other dirt accumulation of safety relief device channels or other parts which could interfere with the functioning of the device? (b)(5)(i)

Are only qualified personnel allowed to service safety relief devices? (b)(5)(i)

When gas cylinders are received at a point for refilling, are all safety relief devices examined externally for corrosion, damage, plugging of external safety relief device channels, and mechanical defects such as leakage or extrusion of fusible metal? (b)(5)(ii)

If there is any doubt regarding the suitability of the safety relief device for service, is the cylinder not filled until it is equipped with a suitable device? (b)(5)(ii)

1910.168 — Reserved

Note: On February 10, 1984, OSHA removed the standard covering Safety Relief Devices for Cargo and Portable Tanks Storing Compressed Gases. For advisory reasons only, we are retaining the items below as an aid to subscribers who may wish to use the information in their programs.

(b) General Requirements.

Application. (b)(1)

Do compressed gas cylinders, portable tanks, and cargo tanks have pressure relief devices installed and maintained in accordance with Compressed Gas Association Pamphlets S-1.1-1963 and 1965 addenda, and S-1.2-1963? (b)(1)

1910.168 – SAFETY RELIEF DEVICES FOR CARGO AND PORTABLE TANKS STORING COMPRESSED GASES

(b) General Requirements.

YES NO

Specifications and Tests. (b)(2)

Do all safety relief devices covered by this section meet the design, construction, marking, and test specifications of the Compressed Gas Associations Safety Relief Device Standards Part 2 - Cargo and Portable Tanks for Compressed Gases: S-1.2-1963? (b)(2)

Specific Requirements for Safety Relief Devices. (b)(3)

Is each container provided with one or more safety relief devices which is a safety relief valve of the spring-loaded type unless otherwise specified? (b)(3)(i)

Are safety relief valves set to "start-to-discharge" at a pressure not in excess of 110 percent of the DOT design pressure of the container, nor less than the DOT design pressure of the container, except as follows:

(a) If an overdesigned container is used, the set pressure of the safety relief valve may be between the minimum required DOT design pressure for the lading and 110 percent of the DOT design pressure of the container used.
(b) For sulfur dioxide containers, a minimum set pressure of 120 and 110 p.s.i.g. is permitted for the 150 and 125 p.s.i.g. DOT design pressure containers, respectively.
(c) For carbon dioxide (refrigerated), nitrous oxide (refrigerated), and pressurized liquid argon, nitrogen and oxygen, there shall be no minimum set pressure.
(d) For butadiene, inhibited, and liquefied petroleum gas containers, a minimum set pressure of 90 percent of the minimum DOT design pressure permitted for these ladings may be used.
(e) For containers constructed in accordance with paragraph U-68 or U-69 of the Code, 1949 Edition, the set pressure marked on the safety relief valve may be 125 percent of the original DOT design pressure of the container. (b)(3)(ii)

Are only replacement parts or assemblies provided by the manufacturer of the device used? (b)(3)(iii)

Do safety relief valves have direct communication with the vapor space of the container? (b)(3)(iv)

Are all portions of liquid piping or hose which at any time may be closed at each end, provided with a safety relief device to prevent excessive pressure? (b)(3)(v)

Are the additional restrictions of this subdivision applied to safety relief devices on containers for carbon dioxide or nitrous oxide which are shipped in refrigerated and insulated containers? (b)(3)(vi)

Where pressure controlling devices are used for regulating the maximum operating pressure in the container, are they in addition to the safety relief valve required in the item under 1910.168(b)(3)(i)? (b)(3)(vi)

Are safety relief devices so installed and located that the cooling effect of the contents will not prevent the effective operation of the device? (b)(3)(vii)

Are one or more fusible plugs approved by the Bureau of Explosives, 63 Vesey Street, New York, N.Y. 10007, used in lieu of safety relief valves of the spring-loaded type, and, if so, are they subject to the conditions of CFR (49) 173.315(a)(1) of the DOT Regulations for methyl chloride and sulfur dioxide optional portable tanks of 225 p.s.i.g.? (b)(3)(ix)

1910.168 – SAFETY RELIEF DEVICES FOR CARGO AND PORTABLE TANKS STORING COMPRESSED GASES

(b) General Requirements.

YES NO

If a container is over 30 inches long, is a safety relief device having the total required flow capacity at both ends? (b)(3)(ix)

When storage containers for liquefied petroleum gas are permitted to be shipped in accordance with 49 CFR 173.315(j), are they equipped with safety relief devices in compliance with the requirements for safety relief devices on aboveground containers as specified in the NFPA No. 58-1969? (b)(3)(x)

When containers are filled by pumping equipment which has a discharge capacity in excess of the capacity of the container safety relief devices, are precautions taken to prevent the development of pressure in the container in excess of 120 percent of its DOT design pressure? (b)(3)(xi)

This additional requirement applies to safety relief devices on containers for liquefied hydrogen and pressurized liquid argon, nitrogen, and oxygen. (b)(3)(xii)

Is the liquid container protected by one or more safety relief valves and one or more frangible discs? (b)(3)(xii)

Are safety relief devices so arranged to discharge unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the container? (b)(3)(xii)

Are safety relief devices so arranged to discharge upward? (b)(3)(xiii)

Exception: This is **not** required for carbon dioxide, nitrous oxide and pressurized liquid argon, nitrogen, and oxygen.

Are precautions taken to insure that no shutoff valves are installed between the safety relief devices and the container? (b)(3)(xiv)

Exception: In cases where two or more safety relief devices are installed on the same container, a shutoff valve may be used where the arrangement of the shutoff valve or valves is such as always to insure full required capacity flow through at least one safety relief device.

Maintenance Requirements for Safety Relief Devices. (b)(4)

Is care exercised to avoid damage to safety relief devices? (b)(4)(i)

Is care also exercised to avoid plugging by paint or other dirt accumulation of safety relief device channels or other parts which could interfere with the functioning of the device? (b)(4)(i)

Are only qualified personnel allowed to service safety relief devices? (b)(4)(ii)

Is any servicing or repairs which requires resetting of safety relief valves done only by or after consultation with the valve manufacturer? (b)(4)(ii)

Are safety relief devices substantially examined externally for corrosion, damage, plugging of external safety relief device channels, and mechanical defects? (b)(4)(ii)

Do valves equipped with secondary resilient seals have the seals inspected periodically? (b)(4)(iii)

Are precautions taken to insure that the container will not be filled if there is any doubt regarding the suitability of the safety relief device for service? (b)(4)(iii)

1910.169 – AIR RECEIVERS

YES NO

(a) General Requirements.

Application. (a)(1)

This section applies to compressed air receivers, and other equipment used in providing and utilizing compressed air for performing operations such as cleaning, drilling, hoisting, and chipping. (a)(1)

New and Existing Equipment. (a)(2)

Are all air receivers that were installed after August 17, 1971, constructed in accordance with the 1968 edition of the ASME Boiler and Pressure Vessel Code Section VIII? (a)(2)(i)

Are all safety valves that are used constructed, installed, and maintained in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Edition 1968? (a)(2)(ii)

(b) Installation and Equipment Requirements.

Installation. (b)(1)

Air receivers shall be so installed that all drains, handholes, and manholes are easily accessible. (b)(1)

Are precautions taken to insure that air receivers will not be buried underground, or located in an inaccessible place? (b)(1)

Is a drain pipe and valve installed at the lowest point of every air receiver to provide for the removal of accumulated oil and water? (b)(2)

Is the drain valve on the air receiver opened, and the receiver completely drained frequently and at such intervals as to prevent the accumulation of excessive amounts of liquid in the receiver? (b)(2)

Gages and Valves. (b)(3)

Is every air receiver equipped with an indicating pressure gage and with one or more spring-loaded safety valves? (b)(3)(i)

Is the total receiving capacity of such safety valves such as to prevent pressure in the receiver from exceeding the maximum allowable working pressure of the receiver by more than 10 percent? (b)(3)(i)

Are precautions taken to insure that no valve of any type will be placed between the air receiver and its safety valve or valves? (b)(3)(ii)

Are precautions taken to insure that all safety appliances shall be constructed, located, and installed so that they cannot be readily rendered inoperative by any means, including the elements? (b)(3)(iii)

Are all safety valves tested frequently and at regular intervals to determine whether they are in good operating condition? (b)(3)(iv)

YES NO

TABLE M-1 – Minimum Allowable Wall Thickness for Low Pressure Cylinders

Cylinder size O.D. x length (inches)	DOT Specification marking	Nominal water capacity (pounds)	Minimum allowable wall thickness (inches)
15 x 46	[1] 4B240	239	0.128
$14\frac{13}{16}$ x 47	4E240	239	.140
$14\frac{15}{16}$ x 46	4BA240	239	.086
$14\frac{11}{16}$ x $28\frac{3}{8}$	4BA240	143	.086
$11\frac{29}{32}$ x $32\frac{11}{16}$	4BA240	95	.078
$11\frac{29}{32}$ x $18\frac{11}{32}$	4BA240	48	.078

[1] Without longitudinal seam.

(Advisory only)

OVERVIEW: SUBPART N

MATERIALS HANDLING AND STORAGE

As indicated by the title, this section contains specifications for the handling of workplace materials, including requirements for industrial trucks, rim wheels servicing, cranes, slings, and helicopters.

Section 1910.176, General materials handling, sets out requirements for the safe storage, transit, and loading of materials. This part requires clear aisles and passageways, housekeeping, guarding of floor openings, and use of blocking devices on industrial trucks and railroad cars.

Section 1910.177, Servicing multi-piece and single-piece rim wheels, applies to the servicing of large vehicles (trucks, tractors, trailers, buses, and off-road machines) and not to automobiles, or vans or pick-up trucks using LT tires. Agriculture, construction, and maritime employments are not covered by this section. Requirements for employee training, servicing equipment, and safe operating procedures are outlined.

Powered industrial trucks. 1910.178, includes requirements for the design, maintenance, anduse of industrial trucks powered by electric or internal combustion engines (forklift trucks, tractors, platform lift trucks, etc..) Industrial trucks powered by compressed air or nonflammable com-pressed gas are excluded from this specific standard, as are farm vehicles and vehicles used primarily for earth moving or over-the-road hauling.

Overhead and gantry cranes, 1910.179, applies to all cranes having trolleys and similar travelcharacteristics, including semi-gantry, cantilever gantry, wall, and storage bridge cranes. This section contains requirements for the design, electrical equipment, inspections, and maintenance of cranes, as well as employee protection.

Crawler locomotive and truck cranes, 1910.180, applies to cranes of the truck and self-propelled type used as lifting cranes, excluding cranes designed for clearing automobile and railway wrecks. Design, inspection and testing, loading, and clearance requirements are all outlined.

Derricks, 1910.181, applies to all stationary derricks and excludes floating derricks. This section requires proper design, loading, inspections and testing, and maintenance as well as the observation of various other general safety rules.

Helicopters, 1910.183 covers all uses of helicopters and helicopter cranes in materials handling, and contains requirements for daily briefings, proper loading, employee protection, safe protection, safe operation, and communications.

Slings, 1910.184, applies to slings used in combination with other materials handling equipment, for hoisting of materials. The section outlines safe operating practices, maintenance and inspections, and safe operating conditions (temperature, and atmosphere and environmental conditions.)

Specific sections of the standards covered in the checklist:

Std. No.		Page No.
1910.176	**General materials handling**	N-01
1910.177	**Servicing multi-piece and single-piece rim wheels**	N-01
1910.178	**Powered industrial trucks**	N-04
1910.179	**Overhead and gantry cranes**	N-07
1910.180	**Crawler locomotive and truck cranes**	N-14
1910.181	**Derricks**	N-18
1910.183	**Helicopters**	N-21
1910.184	**Slings**	N-22

DEFINITIONS — SUBPART N

Note: Definitions applicable to 1910.177, Servicing Multi-Piece and Single-Piece Rim Wheels, may be found on page N-01 of this section.

Definitions applicable to 1910.179, Overhead and gantry cranes:

Automatic crane. A crane which operates through a preset cycle or cycles.

Auxiliary hoist. A supplemental hoisting unit of lighter capacity and usually higher speed than the main hoist.

Brake. A device used for retarding or stopping motion by friction or power means.

Bridge. That part of a crane consisting of girders, trucks, end ties,footwalks, and drive mechanism, which carries the trolley or trolleys.

Bridge travel. The crane movement in a direction parallel to the crane runway.

Bumper (buffer). An energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel; or when two moving cranes or trolleys come in contact.

Cab. The operator's compartment on a crane.

Cab-operated crane. A crane controlled by an operator in a cab located on the bridge or trolley.

Cantilever gantry crane. A gantry or semigantry crane in which the bridge girders or trusses extend transversely beyond the crane runway on one or both sides.

Clearance. The distance from any part of the crane to the nearest obstruction.

Collectors, current. Contacting devices for collecting current from runway or bridge conductors.

Conductors, bridge. The electrical conductors located along the bridge structures of a crane to provide power to the trolley.

Conductors, runway (main). The electrical conductors located along a crane runway to provide power to the crane.

Control braking means. A method of controlling crane motor speed when overhauling.

Controller, spring return. A controller which when released will return automatically to a neutral position.

Countertorque. A method of control by which the power to the motor is reversed to develop torque in the opposite direction.

Crane. A machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine.

Drag brake. A brake which provides retarding force without external control.

Drift point. A point on a travel motion controller which releases the brake while the motor is not energized. This allows for coasting before the brake is set.

Drum. The cylindrical member around which the ropes are wound for raising or lowering the load.

Dynamic. A method of controlling crane motor speeds when overhauling to provide a retarding force.

Emergency stop switch. A manually or automatically operated electric switch to cut off electric power independently of the regular operating controls.

Equalizer. A device which compensates for unequal length or stretch of a rope.

Floor-operated crane. A crane which is pendant or nonconductive rope controlled by an operator on the floor or an independent platform.

Footwalk. The walkway with handrail, attached to the bridge or trolley for access purposes.

Gantry crane. A crane similar to an overhead crane except that the bridge for carrying the trolley or trolleys is rigidly supported on two or more legs running on fixed rails or other runway.

Hoist. An apparatus which may be a part of a crane, exerting a force for lifting or lowering.

Hoist chain. The load bearing chain in a hoist.

Note: Chain properties do not conform to those shown in ANSI B30.9-1971, Safety Code for Slings.

Hoist motion. That motion of a crane which raises and lowers a load.

Holding brake. A brake that automatically prevents motion when power is off.

Hot metal handling crane. An overhead crane used for transporting molten material.

Limit switch. A switch which is operated by some part or motion of a powerdriven machine or equipment to alter the electric circuit associated with the machine or equipment.

Load. The total superimposed weight on the load block or hook.

Load block. The assembly of hook or shackle, swivel, bearing, sheavers, pins, and frame suspended by the hoisting rope.

Magnet. An electromagnetic device carried on a crane hook to pick up loads magnetically.

Main hoist. The hoist mechanism provided for lifting the maximum rated load.

Main switch. A switch controlling the entire power supply to the crane.

Man trolley. A trolley having an operator's cab attached.

Master switch. A switch which dominates the operation of contactors, relays, or other remotely operated devices.

Mechanical. A method of control by friction.

Overhead crane. A crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.

Power-operated crane. A crane whose mechanism is driven by electric, air, hydraulic, or internal combustion means.

Pulpit-operated crane. A crane operated from a fixed operator station not attached to the crane.

Rated load. The maximum load for which a crane or individual hoist is designed and built by the manufacturer. This is shown on the equipment nameplate(s).

Regenerative. A form of dynamic braking in which the electrical energy generated is fed back into the power system.

Remote-operated crane. A crane controlled by an operator not in a pulpit or in the cab attached to the crane, by any method other than pendant or rope control.

Rope. Wire rope, unless otherwise specified.

Running sheave. A sheave which rotates as the load block is raised or lowered.

Runway. An assembly of rails, beams, girders, brackets, and framework on which the crane or trolley travels.

Semigantry crane. A gantry crane with one end of the bridge rigidly supported on one or more legs that run on a fixed rail or runway, the other end of the bridge being supported by a truck running on an elevated rail or runway.

Side pull. That portion of the hoist pull acting horizontally when the hoist lines are not operated vertically.

Span. The horizontal distance center to center of runway rails.

Standby crane. A crane which is not in regular service but which is used occasionally or intermittently as required.

Stop. A device to limit travel of a trolley or crane bridge.

Storage bridge crane. A gantry type crane of long span usually used for bulk storage of material.

Switch. A device for making, breaking, or for changing the connections in an electric circuit.

Trolley. The unit which travels on the bridge rails and carries the hoisting mechanism.

Trolley travel. The trolley movement at right angles to the crane runway.

Truck. The unit consisting of a frame, wheels, bearings, and axles which supports the bridge girders or trolleys.

Wall crane. A traveling crane having a jib with or without trolley and supported from a side wall or lines of columns of a building.

Definitions applicable to 1910.180, Crawler locomotive and truck cranes:

Crawler crane. A rotating superstructure with power plant, operating machinery, and boom, mounted on a base, equipped with crawler treads for travel.

Locomotive crane. A rotating superstructure with power plant operating machinery and boom, mounted on a base or car equipped for travel on railroad track.

Truck crane. A rotating superstructure with powerplant, operating machinery and boom, mounted on an automotive truck equipped with a powerplant for travel.

Wheel mounted crane (wagon crane). Consists of a rotating superstructure with powerplant, operating machinery and boom, mounted on a base or platform equipped with axles and rubber-tired wheels for travel. The base is usually propelled by the engine in the superstructure, but it may be equipped with a separate engine controlled from the superstructure. Its function is to hoist and swing loads at various radii.

Angle indicator (boom). An accessory which measures the angle of the boom to the horizontal.

Axis of rotation. The vertical axis around which the crane superstructure rotates.

Axle. The shaft or spindle with which or about which a wheel rotates.

Axle (bogie). Two or more automotive-type axles mounted in tandem in a frame so as to divide the load between the axles and permit vertical oscillation of the wheels.

Base (mounting). The traveling base or carrier on which the rotating superstructure is mounted, such as a car, truck, crawlers, or wheel platform.

Boom (crane). A member hinged to the front of the rotating superstructure with the outer end supported by ropes leading to a gantry or A-frame and used for supporting the hoisting tackle.

Boom angle. The angle between the longitudinal centerline of the boom and the horizontal. The boom longitudinal centerline is a straight line between the boom foot pin (heel pin) centerline and boom point sheave pin centerline.

Boom hoist. A hoist drum and rope reeving system used to raise and lower the boom.

Boom stop. A device used to limit the angle of the boom at the highest position.

Brake. A device used for retarding or stopping motion by friction or power means.

Cab. A housing which covers the rotating superstructure machinery and/or operator's station. On truck-crane trucks a separate cab covers the driver's station.

Clutch. A friction, electromagnetic, hydraulic, pneumatic, or positive mechanical device for engagement or disengagement of power.

Counterweight. A weight used to supplement the weight of the machine in providing stability for lifting working loads.

Drum. The cylindrical members around which ropes are wound for raising and lowering the load or boom.

Dynamic (loading). Loads introduced into the machine or its components by forces of motion.

Gantry (A-frame). A structural frame, extending above the superstructure, to which the boom support ropes are reeved.

Jib. An extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset to various angles.

Load (working). The external load, in pounds, applied to the crane, including the weight of load-attaching equipment such as load blocks, shackles, and slings.

Load block (upper). The assembly of hook or shackle, swivel, sheaves, pins, and frame suspended from the boom point.

Load block (lower). The assembly of hook or shackle, swivel, sheaves, pins, and frame suspended by the hoisting ropes.

Load hoist. A hoist drum and rope reeving system used for hoisting and lowering loads.

Load rating. Crane ratings in pounds established by the manufacturer.

Outriggers. Extendable or fixed metal arms, attached to the mounting base, which rest on supports at the outer ends.

Rail clamp. A tong-like metal device, mounted on a locomotive crane car, which can be connected to the track.

Reeving. A rope system in which the rope travels around drums and sheaves.

Rope. Wire rope unless otherwise specified.

Side loading. A load applied at an angle to the vertical plane of the boom.

Standby crane. A crane which is not in regular service but which is used occasionally or intermittently as required.

Standing (guy) rope. A supporting rope which maintains a constant distance between the point of attachment to the two components connected by the rope.

Structural competency. The ability of the machine and its components to withstand the stresses imposed by applied loads.

Superstructure. The rotating upper frame structure of the machine and the operating machinery mounted thereon.

Swing. The rotation of the superstructure for movement of loads in a horizontal direction about the axis of rotation.

Swing mechanism. The machinery involved in providing rotation of the superstructure.

Tackle. An assembly of ropes and sheaves arranged for hoisting and pulling.

Transit. The moving or transporting of a crane from one jobsite to another.

Travel. The function of the machine moving from one location to another, on a jobsite.

Travel mechanism. The machinery involved in providing travel.

Wheelbase. The distance between center of front and rear axles.

Whipline (auxiliary hoist). A separate hoist rope system of lighter load capacity and higher speed than the main hoist.

Winch head. A power driven spool for handling of loads by means of friction between fiber or wire rope and spool.

Definitions applicable to 1910.181, Derricks:

Note: For illustration of derricks see page N(a)-02b in the Appendix.

Derrick. An apparatus consisting of a mast or equivalent member held at the head by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes.

A-frame derrick. A derrick in which the boom is hinged from a cross member between the bottom ends of two upright members spread apart at the lower ends and joined at the top; the boom point secured to the junction of the side members, and the side members are braced or guyed from this junction point.

Basket derrick. A derrick without a boom, similar to a gin pole, with its base supported by ropes attached to corner posts or other parts of the structure. The base is at a lower elevation than its supports. The location of the base of a basket derrick can be changed by varying the length of the rope supports. The top of the pole is secured with multiple reeved guys to position the top of the pole to the desired location by varying the length of the upper guy lines. The load is raised and lowered by ropes through a sheave or block secured to the top of the pole.

Breast derrick. A derrick without boom. The mast consists of two side members spread farther apart at the base than at the top and tied together at top and bottom by rigid members. The mast is prevented from tipping forward by guys connected to its top. The load is raised and lowered by ropes through a sheave or block secured to the top crosspiece.

Chicago boom derrick. A boom which is attached to a structure, an outside upright member of the structure serving as the mast, and the boom being stepped in a fixed socket clamped to the upright. The derrick is complete with load, boom, and boom point swing line falls.

Gin pole derrick. A derrick without a boom. Its guys are so arranged from its top as to permit leaning the mast in any direction. The load is raised and lowered by ropes reeved through sheaves or blocks at the top of the mast.

Guy derrick. A fixed derrick consisting of a mast capable of being rotated, supported in a vertical position by guys, and a boom whose bottom end is hinged or pivoted to move in a vertical plane with a reeved rope between the head of the mast and the boom point for raising and lowering the boom, and a reeved rope from the boom point for raising and lowering the load.

Shearleg derrick. A derrick without a boom and similar to a breast derrick. The mast, wide at the bottom and narrow at the top, is hinged at the bottom and has its top secured by a multiple reeved guy to permit handling loads at various radii by means of load tackle suspended from the mast top.

Stiffleg derrick. A derrick similar to a guy derrick except that the mast is supported or held in place by two or more stiff members, called stifflegs, which are capable or resisting either tensile or compressive forces. Sills are generally provided to connect the lower ends of the stifflegs to the foot of the mast.

Boom. A timber or metal section or strut, pivoted or hinged at the heel (lower end) at a location fixed in height on a frame or mast or vertical member, and with its point (upper end) supported by chains, ropes, or rods to the upper end of the frame, mast, or vertical member. A rope for raising and lowering the load is reeved through sheaves or a block at the boom point. The length of the boom shall be taken as the straight line distance between the axis of the foot pin and the axis of the boom point sheave pin, or where used, the axis of the upper load block attachment pin.

Boom harness. The block sheave arrangement on the boom point to which the topping lift cable is reeved for lowering and raising the boom.

Boom point. The outward end of the top section of the boom.

Derrick bullwheel. A horizontal ring or wheel, fastened to the foot of a derrick, for the purpose of turning the derrick by means of ropes leading from this wheel to a powered drum.

Eye. A loop formed at the end of a rope by securing the dead end to the live end at the base of the loop.

Fiddle block. A block consisting of two sheaves in the same plane held in place by the same cheek plates.

Foot bearing or foot block (sill block). The lower support on which the mast rotates.

Gudgeon pin. A pin connecting the mast cap to the mast allowing rotation of the mast.

Guy. A rope used to steady or secure the mast or other member in the desired position.

Load, working. The external load, in pounds, applied to the derrick, including the weight of load attaching equipment such as load blocks, shackles, and slings.

Load block, lower. The assembly of sheaves, pins, and frame suspended by the hoisting rope.

Load block, upper. The assembly of sheaves, pins, and frame suspended from the boom.

Mast. The upright member of the derrick.

Mast cap (spider). The fitting at the top of the mast to which the guys are connected.

Reeving. A rope system in which the rope travels around drums and sheaves.

Rope. Wire rope unless otherwide specified.

Safety hook. A hook with a latch to prevent slings or load from accidentally slipping off the hook.

Side loading. A load applied at an angle to the vertical place of the boom.

Sill. A member connecting the foot block and stiffleg or a member connecting the lower ends of a double member mast.

Standby derrick. A derrick not in regular service which is used occasionally or intermittently as required.

Stiffleg. A rigid member supporting the mast at the head.

Swing. Rotation of the mast and/or boom for movements of loads in a horizontal direction about the axis of rotation.

Definitions applicable to 1910.184, Slings:

Angle of loading. The inclination of a leg or branch of a sling measured from the horizontal or vertical plane; provided that an angle of loading of five degrees or less from the vertical may be considered a vertical angle of loading.

Basket hitch. A sling configuration whereby the sling is passed under the load and has both ends, end attachments, eyes or handles on the hook or a single master link.

Braided wire rope. A wire rope formed by plaiting component wire ropes.

Bridle wire rope sling. A sling composed of multiple wire rope legs with the top ends gathered in a fitting that goes over the lifting hook.

Cable laid endless sling-mechanical joint. A wire rope sling made endless by joining the ends of a single length of cable laid rope with one or more metallic fittings.

Cable laid grommet-hand tucked. An endless wire rope sling made from one length of rope wrapped six times around a core formed by hand tucking the end of the rope inside the six wraps.

Cable laid rope. A wire rope composed of six wires wrapped around a fiber or wire rope core.

Cable laid rope sling-mechanical joint. A wire rope sling made from a cable laid rope with eyes fabricated by pressing or swaging one or more metal sleeves over the rope junction.

Choker hitch. A sling configuration with one end of the sling passing under the load and through an end attachment, handle or eye on the other end of the sling.

Coating. An elastomer or other suitable material applied to a sling or to a sling component to impart desirable properties.

Gross rod. A wire used to join spirals of metal mesh to form a complete fabric.

Fabric (metal mesh). The flexible portion of a metal mesh sling consisting of a series of transverse coils and cross rods.

Female handle (choker). A handle with a handle eye and a slot of such dimension as to permit passage of a male handle thereby allowing the use of a metal mesh sling in a choker hitch.

Handle. A terminal fitting to which metal mesh fabric is attached.

Handle eye. An opening in a handle of a metal mesh sling shaped to accept a hook, shackle or other lifting device.

Hitch. A sling configuration whereby the sling is fastened to an object or load, either directly to it or around it.

Link. A single ring of a chain.

Male handle (triangle). A handle with a handle eye.

Master coupling link. An alloy steel welded coupling link used as an intermediate link to join alloy steel chain to master links.

Master link or gathering ring. A forged or welded steel link used to support all members (legs) of an alloy steel chain sling or wire rope sling.

Mechanical coupling link. A nonwelded, mechanically closed steel link used to attached master links, hooks, etc., to alloy steel chain.

Proof load. The load applied in performance of a proof test.

Proof test. A nondestructive tension test performed by the sling manufacturer or an equivalent entity to verify construction and workmanship of a sling.

Rated capacity or working load limit. The maximum working load permitted by the provisions of this section.

Reach. The effective length of an alloy steel chain sling measured from the top bearing surface of the upper terminal component to the bottom bearing surface of the lower terminal component.

Selvage edge. The finished edge of synthetic webbing designed to prevent unraveling.

Sling. An assembly which connects the load to the material handling equipment.

Spiral. A single transverse coil that is the basic element from which metal mesh is fabricated.

Strand laid endless sling-mechanical joint. A wire rope sling made endless from one length of rope with the ends joined by one or more metallic fittings.

Strand laid grommet-hand tucked. An endless wire rope sling made from one length of strand wrapped six times around a core fromed by hand tucking the ends of the strand inside the six wraps.

Strand laid rope. A wire rope made with strands (usually six or eight) wrapped around a fiber core, wire strand core, or independent wire rope core (IWRC).

Vertical hitch. A method of supporting a load by a single, vertical part or leg of the sling.(See Fig. N-184-4).

T2

1910.176 — HANDLING MATERIALS — GENERAL

YES NO

(a) Use of Mechanical Equipment.

Where mechanical handling equipment is used, are there sufficient safe clearances allowed for aisles, at loading docks, through doorways and wherever turns or passage must be made? **(a)**

Are aisles and passageways kept clear and in good repair? **(a)**

Are there obstructions across or in aisles that could create a hazard? **(a)**

Are permanent aisles and passageways appropriately marked? **(a)**

(b) Secure Storage.

Are precautions taken to insure that storage of material will not create a hazard? **(b)**

Are bags, containers, bundles, etc., stored in tiers stacked, blocked, interlocked and limited in height so that they are stable and secure against sliding or collapse? **(b)**

(c) Housekeeping.

Are storage areas kept free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harborage? **(c)**

Is vegetation control exercised when necessary? **(c)**

(e) Clearance Limits.

Are provisions made to insure that clearance signs will be provided? **(e)**

(f) Rolling Railroad Cars.

Are derail and/or bumper blocks provided on spur railroad tracks where a rolling car could contact other cars being worked, where they could enter a building, work or traffic area? **(f)**

(g) Guarding.

Are covers and/or guardrails provided to protect personnel from the hazards of open pits, tanks, vats, ditches, etc.? **(g)**

1910.177 — SERVICING MULTI-PIECE AND SINGLE PIECE RIM WHEELS

[**Note:** Parts of this section have been revised, as indicated]

The original standard covering multi-piece rim wheels became effective April 28, 1980. It was amended to include single piece rim wheels effective March 5, 1984.

(a) Scope.

This section applies to servicing multi-piece and single piece rim wheels used on large vehicles such as trucks, tractors, trailers, buses and off-road machines. **(a)(1)**

Note: It does not apply to servicing rim wheels used on automobiles, pickup tracks, and vans utilizing tires designated "LT."

This section does not apply to workplaces regulated under Construction Standards 29 CFR Part 1926; Agricultural Standards 29 CFR Part 1928; the Shipyard Standards 29 CFR Part 1915; or the Longshoring Standards 29 CFR Part 1918. **[Revised 1987]** **(a)(2)**

1910.177 — SERVICING MULTI-PIECE AND SINGLE PIECE RIM WHEELS

YES NO

Unless designated otherwise, all provisions apply to both single piece and multi-piece rim wheels. **(a)(3)**

(b) Definitions.

"Barrier" means a fence, wall, or other structure or object placed between a single piece rim wheel and an employee during tire inflation to contain the rim wheel components in the event of the sudden release of the contained air of the single piece rim wheel.

"Charts" means the United States Department of Transportation, Occupational Safety and Health Administration publications entitled "Demounting and Mounting Procedures for Truck/Bus Tires" and "Multi-piece Rim Matching Chart," the National Highway Traffic Safety Administration (NHTSA) publications entitled "Demounting and Mounting Procedures Truck/Bus Tires" and "Multi-piece Rim Matching Chart," or any other poster which contains at least the same instructions, safety precautions and other information contained in the charts that is applicable to the types of wheels being serviced. **[Revised 1988]**

"Installing a rim wheel" means the transfer and attachment of an assembled rim wheel onto a vehicle axle hub. "Removing" means the opposite of installing.

"Mounting a tire" means the assembly or putting together of the wheel and tire components to form a rim wheel, including inflation. "Demounting" means the opposite of mounting. "Multi-piece rim wheel" means the assemblage of a multi-piece wheel with the tire tube and other components.

"Multi-piece wheel" means a vehicle wheel consisting of two or more parts, one of which is a side or locking ring designed to hold the tire on the wheel by interlocking components when the tire is inflated.

"Restraining device" means an apparatus such as a cage, rack, assemblage of bars and other components that will constrain all rim wheel components during an explosive separation of a multi-piece rim wheel, or during the sudden release of the contained air of a single piece rim wheel.

"Rim manual" means a publication containing instructions from the manufacturer or other qualified organization for correct mounting, demounting, maintenance, and safety precautions peculiar to the type of wheel being serviced.

"Rim wheel" means an assemblage of tire, tube and liner (where appropriate), and wheel components.

"Service" or "servicing" means the mounting and demounting of rim wheels, and related activities such as inflating, deflating, installing, removing, and handling.

"Service area" means that part of an employer's premises used for the servicing of rim wheels, or any other place where an employee services rim wheels.

"Single piece rim wheel" means the assemblage of a single piece rim wheel with the tire and other components.

"Single piece wheel" means a vehicle wheel consisting of one part, designed to hold the tire on the wheel when the tire is inflated.

"Trajectory" means any potential path or route that a rim wheel component may travel during an explosive separation, or the sudden release of the pressurized air, or an area at which an airblast from a single piece rim wheel may be released. The trajectory may deviate from paths which are perpendicular to the assembled position of the rim wheel at the time of separation or explosion. (See Appendix A on page N-App-3 in the Self-Inspection Appendix for examples of trajectories.)

"Wheel" means that portion of a rim wheel which provides the method of attachment of the assembly to the axle of a vehicle and also provides the means to contain the inflated portion of the assembly (i.e., the tire and/or tube).

(c) Employee Training.

Does the employer provide a training program that is designed to instruct all employees who service rim wheels in the hazards involved and the safety precautions to be followed? **(c)(1)**

Can the employer assure that no employee services any rim wheels unless the employee has been trained and instructed in correct procedures of mounting, demounting, and all related services, activities and correct safety precautions for the rim type being serviced, and the safe operating procedures described in paragraphs (f) and (g) of this section? **(c)(1)(i)**

Has the employer assured that the information listed in the training program includes, as a minimum, the data contained on the charts (rim manuals) and content of this standard? **(c)(1)(ii)**

When an employer knows or has reason to believe that any of his employees is unable to read and understand the charts or rim manual, does the employer assure that these employees are adequately instructed concerning the contents of the charts and rim manual in a manner which the employee is able to understand? **(c)(1)(iii)**

Does the employer assure that each employee demonstrates and maintains his ability to service rim wheels safely, including performance of the followng tasks: **(c)(2)**

Demounting of tires (including deflation); **(c)(2)(1)**

Inspection and identification of wheel components; **(c)(2)(ii)**

Mounting of tires (including inflation within a restraining device or other safeguard required by this section); **(c)(2)(iii)**

Use of a restraining device or barrier and other required equipment; **(c)(2)(iv)**

Handling of rim wheels; **(c)(2)(v)**

Inflation of tires when a single piece rim wheel is mounted on the vehicle; **(c)(2)(vi)**

The necessity of standing outside the trajectory during inflation of the tire and during inspection of the rim wheel following inflation; and **(c)(2)(vii)**

Installation and removal of rim wheels? **(c)(2)(viii)**

Are evaluations made of each employee's ability to perform these tasks and to service rim wheels safely, and has additional necessary training been provided to assure that each employee maintains his or her proficiency? **(c)(3)**

(d) Tire Servicing Equipment.

Does the employer furnish and assure that employees use a restraining device when servicing multi-piece rim wheels? **(d)(1)**

Is a restraining device or barrier provided for inflating tires on single piece wheels unless the rim wheels will be bolted onto a vehicle during inflation? **(d)(2)**

Does each restraining device or barrier have the capacity to safely withstand the maximum force that would be transferred to it during an explosive wheel separation occurring at 150% of maximum tire specification pressure for the wheels being serviced? **(d)(3)(i)**

Is the restraining device or barrier capable of preventing rim components from being thrown outside or beyond the device or barrier regardless of wheel position within or behind the device? **(d)(3)(ii)**

Does the employer require that restraining devices and barriers be inspected prior to each day's use and after any explosive separation of wheel components? **(d)(3)(iii)**

Are restraining devices and barriers exhibiting any of the following defects immediately removed from service:

(a) Cracks at welds;

(b) Cracked or broken components;

(c) Bent or sprung components caused by mishandling, abuse or wheel separation;

(d) Pitting of components due to excessive corrosion; or

(e) Structural damage which would decrease its effectiveness?

Does the employer require that restraining devices or barriers removed from service in accordance with paragraph (d)(3)(iii) of this section not be returned to service until they are inspected, repaired if necessary, and are certified either by the manufacturer or by a registered professional engineer as meeting the strength requirements or paragraph (d)(3)(i) of this section? **(d)(3)(iv)**

Has the employer furnished and required the use of an airline assembly consisting of the following components be used for inflating tires: **(d)(4)**

(a) A clip-on chuck;

(b) An in-line valve with a pressure gauge or a presettable regulator, and

(c) A sufficient length of hose between the clip-on chuck and the in-line valve (if one is used) to allow the employee to stand outside the trajectory? **(d)(4)**

Are current charts or rim manuals containing instructions for the type of wheels being serviced available in the service area? [**Revised 1988**] **(d)(5)**

Has the employer assured that only tools recommended in the rim manual for the type of wheels being serviced are used to service rim wheels? **(d)(6)**

(e) Wheel Component Acceptability.

Multi-piece wheel components shall not be interchanged except as provided in the charts or applicable rim manual. **(e)(1)**

Are all wheel components inspected prior to assembly?

Are rim bases, side rings or lock rings which are bent out of shape, pitted from corrosion, broken or cracked, marked or tagged unserviceable and removed from service area? **(e)(2)**

Damaged or leaky valves are to be replaced. **(e)(2)**

1910.177 — SERVICING MULTI-PIECE AND SINGLE PIECE RIM WHEELS

	YES	NO
Are mating surfaces of the rim gutter, rings and tire free of any dirt, surface rust, scale or rubber buildup prior to mounting and inflating? **(e)(3)**		
Is a check made of the size (bead diameter and tire/wheel width) and type of tire and wheel for compatibility prior to assembly of the rim wheel? **(e)(4)**		
(f) Safe Operating Procedure — Multi-piece Rim Wheels.		
Has the employer established a safe operating procedure for servicing multi-piece rim wheels and provided assurance that employees are adequately instructed in, and follow this procedure?		
Does this safe operating procedure include at least the following requirements?		
Tires shall be completely deflated before demounting by removal of the valve core. **(f)(1)**		
Tires shall be completely deflated by removing the valve core before a wheel is removed from the axle in either of the following situations: **(f)(2)**		
(a) When the tire has been driven underinflated at 80% or less of its recommended pressure, or **(f)(2)(i)**		
(b) When there is obvious or suspected damage to the tire or wheel components. **(f)(2)(ii)**		
Are rubber lubricants applied to bead and rim mating surfaces during assembly of the wheel and inflation of the tire unless manufacturer advises against it? **(f)(3)**		
Do operating procedures require that tires be inflated only when contained by a restraining device except when the wheel assembly is on a vehicle? Tires that are underinflated, but have more than 80% of the recommended pressure, may be inflated while the wheel is on the vehicle if remote control inflation equipment is used and no employees are in the trajectory. **(f)(4)**		
When tires are inflated outside a restraining device, only a pressure sufficient to force the tire bead onto the rim ledge to create an airtight seal with the tire and bead is to be used. **(f)(5)**		
Whenever a tire is in a restraining device, is the employee prevented from resting or leaning any part of his body or equipment on or against the restraining device? **(f)(6)**		
After tire inflation, are the tire, rim, and rings inspected while still within the restraining device to make sure they are properly seated and locked? **(f)(7)**		
Do procedures require that if further adjustment to the tire, rim, or rings is necessary, the tire shall be deflated by removing the valve core before this adjustment is made? **(f)(7)**		
Are employees prohibited from making any attempt to correct the seating of side and lock rings by hammering, striking, or forcing the components while the tire is pressurized? **(f)(8)**		
Are employees prohibited from reworking, welding, brazing, or otherwise heating cracked, broken, bent, or otherwise damaged rim components? **(f)(9)**		

1910.177 — SERVICING MULTI-PIECE AND SINGLE PIECE RIM WHEELS

	YES	NO
Have procedures been established to prevent employees from entering the trajectory whenever multi-piece rim wheels are being handled?		
Have procedures been established by the employer to demonstrate what conditions make the employee's presence in the trajectory necessary? **(f)(10)**		
Is care taken to ensure that heat shall not be applied to a multi-piece wheel or wheel component? **(f)(11)**		
(g) Safe Operating Procedures — Single Piece Rim Wheels.		
A safe operating procedure for servicing single piece rim wheels must be established.		
It must be assured that employees are instructed in and required to follow the procedures which shall include at least the following elements:		
Tires must be completely deflated by removal of the valve core before demounting. **(g)(1)**		
Mounting and demounting of the tire is to be done only from the narrow ledge side of the wheel.		
Care is to be taken to avoid damaging the tire beads while mounting tires on wheels.		
Tires are to be mounted only on compatible wheels of matching bead diameter and width. **(g)(2)**		
Unless the tire or wheel manufacturer recommends against use of any rubber lubricant, a nonflammable rubber lubricant is to be applied to bead and wheel mating surface before assembly of the rim wheel. **(g)(3)**		
If a tire changing machine is used, the tire is to be inflated only to the minimum pressure needed to force the tire bead onto the rim ledge while on the tire changing machine. **(g)(4)**		
If a bead expander is used, it is to be removed before the valve core is installed and as soon as the rim wheel becomes airtight (the tire bead slips onto the bead seat). **(g)(5)**		
Tires may be inflated only when contained within a restraining device, positioned behind a barrier, or bolted on the vehicle with the lug nuts fully tightened. **(g)(6)**		
Tires are not to be inflated when any flat solid surface is in the trajectory and within one foot of the sidewall. **(g)(7)**		
Employers must ensure that employees stay out of the trajectory when inflating a tire. **(g)(8)**		
Tires are not to be inflated to more than the pressure stamped in the sidewall, unless a higher pressure is recommended by the manufacturer. **(g)(9)**		
Tires are not to be inflated over the maximum pressure recommended by the manufacturer to seat the tire bead firmly against the rim flange. **(g)(10)**		
No heat is to be applied to a single piece wheel. **(g)(11)**		
Cracked, broken, bent, or otherwise damaged wheels are not to be reworked, welded, brazed, or heated. **(g)(12)**		

1910.178 — POWERED INDUSTRIAL TRUCKS

YES NO

[**Note:** Parts of this section have been revised, as indicated]

(a) General Requirements

This section contains safety requirements relating to fire protection for fork trucks, tractors, platform lift trucks, motorized hand trucks and other specialized industrial trucks powered by electric motors or internal combustion engines. **(a)(i)**

This section does not apply to compressed air or nonflammable compressed gas-operated industrial trucks, nor to farm vehicles, nor automotive vehicles for highway use, nor to vehicles intended primarily for earth moving or over-the-road hauling. **(a)(1)**

Do all powered industrial trucks acquired and used by an employer after February 15, 1972 meet the design and struction requirements for powered industrial trucks established in ANSI Standard B56.1-1969, Part II? **(a)(2)**

Do approved trucks bear a label or some other identifying mark indicating approval by the testing laboratory? **(a)(3)**

Are modifications and additions which affect capacity and safe operation prohibited from being performed by the customer or user without manufacturers' prior written approval? **(a)(4)**

If modifications and additions are approved by the manufacturer are the capacity, operation, and maintenance instruction plates, tags, or decals changed accordingly? **(a)(4)**

If the truck is equipped with front-end attachments other than factory installed attachments, has the user requested that the truck be marked to identify the attachments and show the approximate weight of the truck and attachment combination at maximum elevation with load laterally centered? **(a)(5)**

Are precautions taken to insure that all nameplates and markings are in place and are maintained in a legible condition? **(a)(6)**

The term "approved truck" or "approved industrial truck" means a truck that is listed or approved for fire safety purposes for the intended use by a nationally-recognized testing laboratory, using nationally-recognized standards. Refer to section 1910.155 (c)(3)(iv)(A) for definitions of listed (section L of the Merritt OSHA Reference Manual) and to section 1910.7 for definitions of nationally-recognized laboratories (section F of the Merritt OSHA Reference Manual). [**Revised 1988**] **(a)(7)**

(c) Designated Locations

Requirements. **(c)(1)**

Is Table N-1 (see Appendix) used to determine the appropriate truck used for various locations? **(c)(2)**

Are power-operated industrial trucks prohibited from being used in atmospheres containing hazardous concentrations of acetylene, butadiene, ethylene oxide, hydrogen (or gases or vapors equivalent in hazard to hydrogen, such as manufactured gas), propylene oxide, acetaldehyde, cyclopropane, diethyl ether, ethylene, isoprene, or unsymmetrical dimethyl hydrazine (UDMH)? **(c)(2)(i)**

Are power-operated industrial trucks prohibited from being used in atmospheres containing hazardous concentrations of metal dust, including aluminum, magnesium, and their commercial alloys, other metals of similarly hazardous characteristics, or in atmospheres containing carbon black, coal or coke dust, except approved power-operated industrial trucks designated as EX? **(c)(2)(ii)(a)**

In atmospheres where dust of magnesium, aluminum or aluminum bronze may be present, do fuses, switches, motor controllers, and circuit breakers of trucks have enclosures specifically approved for such locations? **(c)(2)(ii)(b)**

Are only approved power-operated industrial trucks designated as EX used in atmospheres containing acetone, acrylonitrile, alcohol, ammonia, benzine, benzol, butane, ethylene dichloride, gasoline, hexane, lacquer solvent vapors, naphtha, natural gas, propane, propylene, styrene, vinyl acetate, vinyl chloride, or xylenes in quantities sufficient to produce explosive or ignitable mixtures, and where such concentrations of these geses or vapors exist continuously, intermittently, or periodically under normal operating conditions or may exist frequently because of repair, maintenance operations, leakage, breakdown or faulty operation of equipment? **(c)(2)(iii)**

Are power-operated industrial trucks designated as DY, EE, or EX used only in locations where volatile flammable liquids or flammable gases are handled, processed or used, but only in the following situations where the hazardous liquids, vapors, or gases are normally confined in closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in the case of abnormal operation of equipment; in locations in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation but which might become hazardous through failure or abnormal operation of the ventilating equipment; or in locations which are adjacent to Class I, Division 1 locations, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clear air, and effective safeguards against ventilation failure are provided? **(c)(2)(iv)**

Are only approved power-operated industrial trucks designated as DS, ES, GS, or LPS used in locations used for the storage of hazardous liquids in sealed containers or liquefied or compressed gases in containers? **(c)(2)(v)**

Are only approved power-operated industrial trucks designated as EX used in atmospheres in which combustible dust is or may be in suspension continuously, intermittently, or periodically under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures, or where mechanical failure or abnormal operation of machinery or equipment might cause such mixtures to be produced? **(c)(2)(vi)(a)**

Are only approved power-operated industrial trucks designated as DY, EE, or EX used in atmospheres in which combustible dust will not normally be in suspension in the air or will not be likely to be thrown into suspension by the normal operation of equipment or apparatus in quantities sufficient to produce explosive or ignitable mixtures but where deposits or accumulations of such dust may be ignited by arcs or sparks originating in the truck? **(c)(2)(vii)**

1910.178 — POWERED INDUSTRIAL TRUCKS

YES NO

Are only approved power-operated industrial trucks designated as DY, EE, or EX used in locations which are hazardous because of the presence of easily ignitable fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitable mixtures? (c)(2)(viii)

Are only approved power-operated industrial trucks designated as DS, DY, ES, EE, EX, GS, or LPS used in locations where easily ignitable fibers are stored or handled, including outside storage? (c)(2)(ix)

Are only approved power-operated industrial trucks specified for such locations in this checklist under (c)(2) used if storage warehouses, and outside storage locations are hazardous? (c)(2)(xi)

Are only approved power-operated industrial trucks specified for such locations in this checklist under paragraph (c)(2) used if general industrial or commercial propertiesare hazardous? (c)(2)(xii)

(e) Safety Guards.

Are High Lift Rider trucks fitted with an overhead guard manufactured in accordance with the items under paragraph (a)(2) of this checklist? (e)(1)

Exception: Unless operating conditions do not permit.

Are fork trucks with a vertical load backrest extension used if the type of load presents a hazard? (e)(2)

(f) Fuel Handling and Storage.

Is the storage and handling of liquid fuels such as gasoline and diesel fuel in accordance with NFPA No. 30-1969? (f)(1)

Is the storage and handling of liquefied petroleum gas fuel in accordance with NFPA No. 58-1969? (f)(2)

(g) Changing and Charging Storage Batteries.

Are battery charging installations located in areas designated for that purpose? (g)(1)

Are facilities provided for flushing and neutralizing spilled electrolyte? (g)(2)

Are facilities provided for fire protection? (g)(2)

Are facilities provided for protecting charging apparatus from damage by trucks? (g)(2)

Are facilities provided for adequate ventilation for dispersal of fumes from gassing batteries? (g)(2)

Is a conveyor, an overhead hoist, or equivalent material handling equipment provided for handling batteries? (g)(4)

Are reinstalled batteries properly positioned and secured in the truck? (g)(5)

Is a carboy tilter or siphon provided for handling electrolyte? (g)(6)

When charging batteries, are precautions taken to insure that acid is poured into water? (g)(7)

Are trucks properly positioned and is the brake applied before attempting to change or charge batteries? (g)(8)

Is the battery (or compartment) cover(s) open to dissipate heat? (g)(9)

Is smoking prohibited in the charging area? (g)(10)

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YES NO

Are precautions taken to prevent open flames, sparks, or electric arcs in battery charging areas? (g)(11)

Are tools and other metallic objects kept away from the top of uncovered batteries? (g)(12)

(h) Lighting for Operating Areas.

Where general lighting is less than 2 lumens per square foot, is auxiliary directional lighting provided on the truck? (h)(2)

(i) Control of Noxious Gases and Fumes.

Are the concentration levels of carbon monoxide gas created by powered industrial truck operations below 50 p.p.m. for an 8-hour day, in accordance with 1910.1 000? (i)(1)

(j) Dockboards

Are items under 1910.30(a) of this checklist complied with when using dockboards or bridge plates? (j)

(k) Trucks and Railroad Cars.

Are the brakes of highway trucks set and wheel chocks placed under the rear wheels to prevent the trucks from rolling while they are boarded with powered industrial trucks? (k)(1)

Are wheel stops or other recognized positive protection provided to prevent railroad cars from moving during loading or unloading operations? (k)(2)

Are fixed jacks used where necessary to support a semitrailer and prevent upending during the loading or unloading when the trailer is not coupled to a tractor? (k)(3)

Are positive protection means provided to prevent railroad cars from being moved while dockboards or bridge plates are in position? (k)(4)

(l) Operator Training.

Are only trained and authorized operators permitted to operate a powered industrial truck? (l)

Are methods devised to train operators in the safe operation of powered industrial trucks? (l)

(m) Truck Operations

Are precautions taken to insure that trucks will not be driven up to anyone standing in front of a bench or other fixed object? (m)(1)

Are employees prohibited from standing or passing under the elevated portion of any truck, whether loaded or empty? (m)(2)

Are unauthorized personnel prohibited from riding on powered industrial trucks? (m)(3)

Where riding of trucks is authorized, is a safe place to ride provided? (m)(3)

Are precautions taken to insure that arms or legs will not be placed between the uprights of the mast or outside the running lines of the truck? (m)(4)

When a powered industrial truck is left unattended are the following items complied with: (1) load engaging means shall be fully lowered, (2) controls shall be neutralized, (3) power shut off, (4) brakes set, (5) wheels shall be blocked if the truck is parked on an incline? (m)(5)(i)

Is the load engaging means fully lowered, controls neutralized, and the brakes set to prevent movement when the operator of an industrial truck is dismounted and within 25 feet of the truck still in his view? (m)(5)(ii)

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	YES	NO
Is a safe distance maintained from the edge of ramps or platforms while on any elevated dock, or platform or freight car? **(m)(6)**		
Are trucks prohibited from being used for opening or closing freight doors? **(m)(6)**		
Are brakes set and wheel blocks in place to prevent movement of trucks, trailers, or railroad cars while loading or unloading? **(m)(7)**		
Are fixed jacks used where necessary to support a semitrailer during loading or unloading when the trailer is not coupled to a tractor? **(m)(7)**		
Is the flooring of trucks, trailers, and railroad cars checked for breaks and weakness before they are driven onto? **(m)(7)**		
Is there sufficient headroom under overhead installations, lights, pipes, sprinkler system, etc.? **(m)(8)**		
Is a fork truck equipped with an overhead guard to protect against falling objects? **(m)(9)**		
Is a load backrest extension used whenever necessary to minimize the possibility of the load or part of it from falling rearward? **(m)(10)**		
Are only approved industrial trucks used in hazardous locations? **(m)(11)**		
Whenever a truck is equipped with vertical only, or vertical and horizontal controls elevatable with the lifting carriage or forks for lifting personnel, are the following additional precautions taken for the protection of personnel being elevated: (i) Is a safety platform firmly secured to the lifting carriage and/or forks? (ii) Are means provided whereby personnel on the platform can shut off power to the truck? (iii) Is such protection from falling objects as indicated necessary by the operating conditions provided? **(m)(12)**		
Are fire aisles, access to stairways, and fire equipment kept clear? **(m)(14)**		
(n) Traveling. Are all traffic regulations, including authorized plant speed limits, observed? **(n)(1)**		
Is a safe distance maintained approximately three truck lengths from the truck ahead, and the truck kept under control at all times? **(n)(1)**		
Is the right of way yielded to ambulances, fire trucks, or other vehicles in emergency situations? **(n)(2)**		
Are precautions taken to insure that trucks traveling in the same direction at intersections, blind spots, or other dangerous locations will not be passed? **(n)(3)**		
Are all drivers required to slow down and sound the horn at cross aisles and other locations where vision is obstructed? **(n)(4)**		
Are all drivers required to travel with the load trailing, if the load being carried obstructs the forward view? **(n)(4)**		
Are all railroad tracks crossed diagonally wherever possible? **(n)(5)**		
Is parking closer then 8 feet from the center of railroad tracks prohibited? **(n)(5)**		

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	YES	NO
Are all drivers required to look in the direction of, and keep a clear view of the path of travel? **(n)(6)**		
Are all drivers required to ascend or descend grades slowly? **(n)(7)**		
Are all drivers required to drive loaded trucks with the load upgrade, when ascending or descending grades in excess of 10 percent? **(n)(7)(i)**		
On all grades is the load and the load engaging means tilted back if applicable, and raised only as far as necessary to clear the road surface? **(n)(7)(iii)**		
Are all drivers required to operate the truck at a speed that will permit it to be brought to a stop in a safe manner? **(n)(8)**		
Is stunt driving and horseplay prohibited? **(n)(9)**		
Are all drivers required to slow down for wet and slippery floors? **(n)(10)**		
Are all dockboard or bridgeplates properly secured before they are driven onto? **(n)(11)**		
Are dockboard or bridgeplates driven over carefully and slowly, and is their rated capacity never exceeded? **(n)(11)**		
Are elevators approached slowly, and then entered squarely after the elevator car is properly leveled? **(n)(12)**		
Once on the elevator, is the driver required to neutralize the controls, shut off the power, and set the brakes? **(n)(12)**		
Are operators of motorized hand trucks required to enter an elevator or other confined areas with load end forward? **(n)(13)**		
Are operators cautioned not to run over loose objects on the roadway surface? **(n)(14)**		
While negotiating turns, is speed reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion? **(n)(15)**		
(o) Loading. Are only stable or safely arranged loads handled? **(o)(1)**		
Is caution exercised when handling off-center loads which cannot be centered? **(o)(1)**		
Are only loads within the rated capacity of the truck handled? **(o)(2)**		
Are all long or high loads which may affect capacity adjusted? **(o)(3)**		
Are trucks equipped with attachments operated as partially loaded trucks when not handling a load? **(o)(4)**		
Is a load engaging means placed under the load as far as possible? **(o)(5)**		
Is the mast carefully tilted backward to stabilize the load? **(o)(5)**		
Is extreme care used when tilting the load forward or backward, particularly when high tiering? **(o)(6)**		
Is tilting forward with the load engaging means elevated prohibited, except to pick up a load? **(o)(6)**		
Are elevated loads prohibited from being tilted forward, except when the load is in a deposit position over a rack or stack? **(o)(6)**		
When stacking or tiering, is only enough backward tilt to stabilize the load used? **(o)(6)**		

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(p) Operation of the Truck.

	YES	NO
Are all trucks taken out of service when they are found to be in need of repair? (p)(1)		
Are all trucks taken out of service when they are found to be in any way unsafe? (p)(1)		
Is the filling of fuel tanks prohibited while the engine is running? (p)(2)		
Is the spillage of fuel required to be avoided? (p)(2)		
If there is any spillage of oil or fuel is it carefully washed away or completely evaporated, and the fuel tank cap replaced before restarting the engine? (p)(3)		
Are trucks with leaks in the fuel system prohibited from being operated until the leak has been corrected? (p)(4)		
Is the use of open flames for checking electrolyte level in storage batteries or gasoline level in fuel tanks prohibited? (p)(5)		

(q) Maintenance of Industrial Trucks.

	YES	NO
Are all power-operated industrial trucks not in safe operating condition removed from service? (q)(1)		
Are all repairs made only by authorized personnel? (q)(1)		
Are repairs prohibited from being made in Class I, II, and III locations? (q)(2)		
Are those repairs to the fuel and ignition systems of industrial trucks which involve fire hazards conducted only in locations designated for such repairs? (q)(3)		
Are trucks that are in need of repairs to the electrical system required to have the battery disconnected prior to such repairs? (q)(4)		
Are all parts of any such industrial trucks requiring replacement replaced only with parts equivalent as to safety with those used in the original design? (q)(5)		
Except as specifically provided for in item (12) below, are industrial trucks prohibited from being altered, including adding parts to, or removing parts from those provided in the original manufacture? (q)(6)		
Is additional counterweighting of fork trucks prohibited, except those approved by the truck manufacturer? (q)(6)		
Are industrial trucks examined before being placed into service? (q)(7)		
Is any truck found to show any condition that will adversely affect the safety of the vehicle prohibited from being placed into service? (q)(7)		
Is such examination made at least daily? (q)(7)		
NOTE: Where industrial trucks are used on a round-the-clock basis, are they examined after each shift?		
Are defects when found immediately reported and corrected?		
Are water mufflers filled daily or as frequently as is necessary to prevent depletion of the supply of water below 75 percent of the filled capacity? (q)(8)		
Are vehicles with mufflers having screens or other parts that may become clogged prohibited from being operated while such screens or parts are clogged? (q)(8)		

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	YES	NO
Is any vehicle that emits hazardous sparks or flames from the exhaust system immediately removed from service, and prohibited from being returned to service until the cause of such sparks and flames has been eliminated? (q)(8)		
When the temperature of any part of any truck is found to be in excess of its normal operating temperature, is the vehicle removed from service and not returned to service until the cause for such overheating has been eliminated? (q)(9)		
Are industrial trucks kept in a clean condition, free of lint, excess oil, and grease? (q)(10)		
Are only noncombustible agents used for cleaning trucks? (q)(10)		
Are low flashpoint solvents prohibited from being used? (q)(10)		
Are precautions regarding toxicity, ventilation, and fire hazard consonant with the agent or solvent used? (q)(10)		
If industrial trucks originally approved for the use of gasoline for fuel are converted to liquefied petroleum gas fuel, does such conversion result embody the features specified for LP or LPS designated trucks? (q)(12)		
Does such conversion equipment appear is approved? (q)(12)		

1910.179 — OVERHEAD AND GANTRY CRANES

[**Note**: Parts of this section have been revised, as indicated]

(b) General Requirements.

	YES	NO
Application. (b)(1)		
This section applies to overhead and gantry cranes, including semigantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics. (b)(1)		
New and Existing Equipment. (b)(2)		
Do all new overhead and gantry cranes constructed and installed on or after August 31, 1971 meet the design specifications of ANSI Standard B30.2.0-1967? (b)(2)		
Modifications. (b)(3)		
Are cranes modified and rerated only when such modifications and the supporting structure are checked thoroughly for the new rated load by a qualified engineer or the equipment manufacturer? (b)(3)		
Are all such cranes tested in accordance with the items under paragraph (k)(2) of this section, which follows in the normal sequence? (b)(3)		
Is the new rated load displayed in accordance with subparagraph (5) of this paragraph? (b)(3)		
Wind Indicators and Rail Clamps. (b)(4)		
Are all outdoor storage bridges provided with automatic rail clamps? (b)(4)		
Is a wind-indicating device provided which will give a visible or audible alarm to the bridge operator at a predetermined wind velocity? (b)(4)		
If the clamps act on the rail heads, are any heads or weld flash on the rail heads ground off? (b)(4)		

YES NO

Rated Load Marking. (b)(5)

Is the rated load of the crane plainly marked on each side of the crane? (b)(5)

If the crane has more than one hoisting unit, does each hoist have its own rated load marked on it or its load block, and is this marking clearly legible from the ground or floor? (b)(5)

Clearance From Obstruction. (b)(6)

Is a minimum clearance of 3 inches overhead and 2 inches laterally provided and maintained between crane and obstructions in conformity with Crane Manufacturers Association of America, Inc., Specification No. 61? (b)(6)(i)

Where passageways or walkways are provided, are obstructions prohibited from being placed so that the safety of personnel will be jeopardized by movements of the crane? (b)(6)(ii)

Clearance Between Parallel Cranes. (b)(7)

Is there adequate clearance provided and maintained between the two bridges, if the runways of two cranes are parallel, and there are no intervening walls or structure? (b)(7)

Are only designated personnel permitted to operate a crane covered by this section? (b)(8)

(c) Cabs.

Cab Location. (c)(1)

Is the general arrangement of the cab and the location of control and protective equipment such that all operating handles are within convenient reach of the operator when facing the area to be served by the load hook, or while facing the direction of travel of the cab? (c)(1)(i)

Does such arrangement allow the operator a full view of the load hook in all positions? (c)(1)(i)

Is the cab so located as to afford a minimum of 3 inches clearance from all fixed structures within its area of possible movement? (c)(1)(ii)

Access to Crane. (c)(2)

Is access to the cab and/or bridge walkway by a conveniently placed fixed ladder, stairs, or platform requiring no step over any gap exceeding 12 inches? (c)(2)

Do fixed ladders comply with ANSI Standard A14.3-1956, and the items under 1910.27 of this checklist? (c)(2)

Fire Extinguisher. (c)(3)

Is a carbon tetrachloride extinguisher prohibited from being used? (c)(3)

Lighting. (c)(4)

Is the light in the cab sufficient to enable the operator to see clearly enough to perform his work? (c)(4)

(d) Footwalks and Ladders.

Location of Footwalks. (d)(1)

If sufficient headroom is available on cab-operated cranes, is a footwalk provided an the drive side along the entire length of the bridge of all cranes having the trolley running on the top of the girders? (d)(1)(i)

Where footwalks are located, in no case shall less than 48 inches of headroom be provided. (d)(1)(ii)

YES NO

Construction of Footwalks. (d)(2)

Are footwalks of rigid construction and destined to sustaina distributed load of at least 50 pounds per square foot? (d)(2)(i)

Are footwalks equipped with a walking surface of antislip type? (d)(2)(ii)

Are footwalks continuous and permanently secured? (d)(2)(iii)

Do footwalks have a clear passageway at least 18 inches wide, except opposite the bridge motor, where they can be 15 inches? (d)(2)(iv)

Does the inner edge extend at least to the line of the outside edge of the lower cover plate or flange of the girder? (d)(2)(iv)

Toeboards and Handrails for Footwalks. (d)(3)

Are toeboards and handrails provided that comply with the items under section 1910.23 of this part? (d)(3)

Ladders and Stairways. (d)(4)

Are gantry cranes provided with ladders or stairways extending from the ground to the footwalk or cab platform? (d)(4)(i)

Are stairways equipped with rigid and substantial metal handrails? (d)(4)(ii)

Are walking surfaces of the antislip type? (d)(4)(ii)

Are ladders permanently and securely fastened in place, and do they comply with the items in this checklist under 1910.27? (d)(4)(iii)

(e) Stops, Bumpers, Rail Sweeps, and Guards.

Trolley Stops. (e)(1)

Are stops provided at the limits of travel of the trolley? (e)(1)(i)

Are stops so fastened that they will resist forces applied when contacted? (e)(1)(ii)

If a stop is on the wheel track, is it at least the height equal to the radius of the wheel? (e)(1)(iii)

Bridge Bumpers. (e)(2)

Is a crane provided with bumpers or other automatic means, except in the following conditions: When a crane always travels at a slow rate of speed and has a faster deceleration rate, due to the use of sleeve bearings; or when the crane is not operated near the ends of the bridge; or is restricted to the limited distance by the nature of the crane operation and there is no hazard of striking any object in this limited distance? (e)(2)(i)

Are bumpers, if they are installed, capable of stopping the crane at an average rate of deceleration not to exceed 3 feet per second when traveling in either direction at 20 percent of the rated load speed? (e)(2)(i)

Do bumpers have sufficient energy absorbing capacity to stop the crane when traveling at a speed of at least 40 percent of the rated load speed? (e)(2)(i)(a)

Are bumpers so mounted that there is no direct shear on the bolts? (e)(2)(i)(b)

Are bumpers so designed and installed as to minimize parts falling from the crane in case of breakage? (e)(2)(i)(c)

	YES	NO
Trolley Bumpers. (e)(3)		
Are trolleys provided with bumpers or other automatic means of equivalent effect except in the following conditions: If the trolley travels at a slow rate of speed; or is not operated near the ends of the bridge; or is restricted to a limited distance of the runway and there is no hazard of striking any object in this limited distance? (e)(3)(i)		
Are bumpers capable of stopping the trolley at an average rate of deceleration not to exceed 4.7 per second when traveling in either direction at one-third of the rated load speed? (e)(3)(i)		
Rail Sweeps. (e)(4)		
Are bridge trucks equipped with sweeps which extend below the top of the rail and project in front of the truck wheels? (e)(4)		
Guards for Hoisting Ropes. (e)(5)		
Are guards installed where hoisting-ropes run near enough to other parts to make fouling of chafing possible? (e)(5)(i)		
Guards for Moving Parts. (e)(6)		
Are all exposed moving parts which might constitute a hazard guarded? (e)(6)(i)		
Are such guards securely fastened? (e)(6)(ii)		
Is each such guard capable of supporting without permanent distortion, the weight of a 200 pound person except where it is impossible for a person to step on it? (e)(6)(iii)		
(f) Brakes.		
Brakes for Hoists. (f)(1)		
Is each independent hoisting unit of a crane equipped with at least one holding brake, applied directly to the motor shaft or some part of the gear train? (f)(1)(i)		
Is each independent hoisting unit equipped with control braking means to prevent overspeeding? (f)(1)(ii)		
Exception: Worm-geared hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction.		
Holding Brakes. (f)(2)		
Do holding brakes for hoist motors have at least the following sequence of the full load hoisting torque at the point where the brake is applied? (a) 125 percent when used with a control braking means other than mechanical; (b) 100 percent when used in conjunction with a mechanical control braking means; (c) 100 percent each if two holding brakes are provided? (f)(2)(i)		
Do holding brakes on hoists have ample thermal capacity for the frequency of operation required by the service? (f)(2)(ii)		
Are holding brakes on hoists automatically applied when power is removed? (f)(2)(iii)		
Where necessary, are holding brakes provided with adjustment means to compensate for wear? (f)(2)(iv)		
Are precautions taken to insure that the wearing surface of all holding-brake drums or discs is smooth? (f)(2)(v)		
Is each independent hoisting unit of a crane handling hot metal and having power control braking means equipped with at least two holding brakes? (f)(2)(vi)		

	YES	NO
Control Braking Means. (f)(3)		
Is the power control braking means capable of maintaining safe lowering speeds of rated loads? (f)(3)(i)		
Does the control braking means have ample thermal capacity for the frequency of operation required by service? (f)(3)(ii)		
Brakes for Trolleys and Bridges. (f)(4)		
Are precautions taken to insure that foot operated brakes will not require an applied force of more than 70 pounds to develop manufacturer's rated brake torque? (f)(4)(i)		
Are brakes applied by mechanical, electrical, pneumatic, hydraulic or gravity means? (f)(4)(ii)		
Are such brakes provided with adjustment means to compensate for wear? (f)(4)(iii)		
Are precautions taken to insure that the wearing surface of all brakedrums or discs are smooth? (f)(4)(iv)		
Are foot-brake pedals so constructed that the operator's foot will not easily slip off the pedal? (f)(4)(v)		
Are foot-operated brakes equipped with automatic means for positive release when pressure is released from the pedal? (f)(4)(vi)		
Are brakes for stopping the motion of the trolley or bridge of a sufficient size to stop the trolley or bridge within a distance in feet equal to 10 percent of full load speed in feet per minute when traveling at full speed with full load? (f)(4)(vii)		
If holding brakes are provided on the bridge or trolleys, are they so installed so as not to prohibit the use of a drift point in the control circuit? (f)(4)(viii)		
Do brakes on trolleys and bridges have ample thermal capacity for the frequency of operation required by the service to prevent impairment of functions from overheating? (f)(4)(ix)		
Application of Trolley Brakes. (f)(5)		
Where the operator's cab is on the trolley, do the trolley brakes comply with the items in (4) above? (f)(5)(i)		
Application of Bridge Brakes. (f)(6)		
Where the operator's cab is on the bridge, do the bridge brakes comply with the items under (4) above? (f)(6)(i)		
Where the operator's cab is on the trolley, is a bridge brake of the holding type required? (f)(6)(ii)		
On all floor, remote and pulpit-operated crane bridge drives, is there a brake or noncoasting mechanical drive provided? (f)(6)(iii)		
(g) Electric Equipment.		
General. (g)(1)		
Does wiring and equipment comply with the electrical requirements of subpart S? (g)(1)(i)		
Are precautions taken to insure that the control circuit voltage will not exceed 600 volts for a.c. or d.c.? (g)(1)(ii)		
Are precautions taken to insure that the voltage at pendant push-buttons will not exceed 150 volts for a.c. and 300 volts d.c.? (g)(1)(iii)		
Are precautions taken to insure that suspended push-button stations will not be supported by their electrical conductors? (g)(1)(iv)		

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	YES	NO
Are pendant control boxes constructed to prevent electrical shock? (g)(1)(v)		
Are control buttons clearly marked for identification of functions? (g)(1)(v)		
Equipment (g)(2)		
Is electrical equipment so located or enclosed that live parts will not be exposed to accidental contact under normal operating conditions? (g)(2)(i)		
Is electrical equipment protected from dirt, grease, oil, and moisture? (g)(2)(ii)		
Are guards for live electrical parts substantial, and so located that they cannot be accidentally deformed so as to make contact with the live parts? (g)(2)(iii)		
Controllers. (g)(3)		
Are cranes that are not equipped with spring-return controllers or momentary contact push-buttons provided with a device which will disconnect all motors from the line on failure of power? (g)(3)(i)		
Does such device prohibit the motor from being restarted until the controller handle is brought to the "off" position, or a reset switch or button is operated? (g)(3)(i)		
Are lever operated controllers provided with a notch or latch to insure that the handle cannot inadvertently be moved to the "on" position? (g)(3)(ii)		
Are controller operating handles located within convenient reach of the operator? (g)(3)(iii)		
Does each controller handle move in the same general direction as the resultant movement of the load? (g)(3)(iv)		
Are the controls for the bridge and trolley travel so located that the operator can readily face the direction of travel? (g)(3)(v)		
For floor-operated cranes, do rope operateer controllers return to the "off" position automatically when released by the operator? (g)(3)(vi)		
Do push-buttons on pendant stations return to the "off" position when pressure is related by the crane operator? (g)(3)(vii)		
Are automatic cranes so designed that all motions shall fail safe if any malfunction of operation occurs? (g)(3)(viii)		
On remote-operated cranes, are precautions taken to insure that if the control signal for any crane motion becomes ineffective the crane motion will stop? (g)(3)(ix)		
Resistors. (g)(4)		
Do enclosures for resistors have openings to provide adequate ventilation? (g)(4)(i)		
Are such enclosures installed to prevent the accumulation of combustible matter too near to hot parts? (g)(4)(i)		
Are resistor units so supported as to be as free as possible from vibration? (g)(4)(ii)		
Are provisions made to prevent broken parts or molten metal from falling upon the operator or from the crane? (g)(4)(iii)		
Switches. (g)(5)		
Is the power supply to the runway conductors controlled by a switch or circuit breaker located on a fixed structure accessible from the floor, and arranged so as to be locked in the open position? (g)(5)(i)		

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	YES	NO
On cab-operated cranes is there a switch or circuit breaker of the enclosed type provided in the leads from the runway conductors? (g)(5)(ii)		
Are provisions made for locking the switch or circuit breaker in the open position? (g)(5)(ii)		
Is the means of opening the switch or circuit breaker located within easy reach of the operator? (g)(5)(ii)		
On floor-operated cranes, is there a switch or circuit breaker of the enclosed type provided in the leads from the runway conductors? (g)(5)(iii)		
Is such switch or circuit breaker provided with the means for locking in the open position? (g)(5)(iii)		
Is this disconnecting means mounted on the bridge or footwalk near the runway collectors? (g)(5)(iii)		
Is one of the following types of floor-operated disconnects provided: (a) A nonconductive rope attached to the main disconnect switch; (b) An undervoltage trip for the main circuit breaker operated by an emergency stop button in the pendant push-button in the pendant push-button station; (c) A main line contactor operated by a switch or push-button in the pendant pushbutton station? (g)(5)(iii)		
Are all hoists equipped with limit switches to prevent overtravel in the hoisting direction? (g)(5)(iv)		
Are cranes that use a lifting magnet equipped with a magnet circuit switch of the enclosed type with provisions for locking in the open position? (g)(5)(v)		
Are means provided for discharging the inductive load of the magnet? (g)(5)(v)		
Runway Conductors. (g)(6)		
Are conductors of the open type mounted on the crane runway beams or overhead so located or so guarded that persons entering or leaving the cab or crane footwalk normally could not come into contact with them? (g)(6)		
Extension Lamps. (g)(7)		
Are all service receptacles that may be installed in the cab or on the bridge of cab-operated cranes of the grounded three-prong type, not exceeding 300 volts? (g)(7)		
(h) Hoisting Equipment.		
Sheaves. (h)(1)		
Are sheave grooves smooth and free from surface defects? (h)(1)(i)		
Are sheaves carrying ropes which can be momentarily unloaded provided with a close-fitting guard or other suitable device to guide the rope back into the groove when the load is applied again? (h)(1)(ii)		
Are sheaves in the bottom block equipped with close-fitting guards that will prevent ropes from becoming fouled when the block is lying on the ground with ropes loose? (h)(1)(iii)		
Are pockets and flanges of sheaves used with hoist chains of such a dimension that the chain does not catch or bind during operations? (h)(1)(iv)		

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YES NO

Are all running sheaves equipped with means for lubrication? (h)(1)(v)

Exception: Permanently lubricated, sealed and/or shielded bearings.

Ropes. (h)(2)

Are crane manufacturer's recommendations followed in using hoisting ropes? (h)(2)(i)

Are precautions taken to insure that a safety factor of 5 will be used on all hoisting ropes? (h)(2)(i)

Is all socketing done in the manner specified by the manufacturer of the assembly? (h)(2)(ii)

Are ropes secured to the drum as follows:

(a) To insure that at least two wraps of rope will remain on the drum when the hook is in its extreme low position;

(b) The rope end anchored by a clamp securely attached to the drum, or by a socket arrangement approved by the crane or rope manufacturer? (h)(2)(iii)

Are precautions taken to insure that the rope clip is attached with the U-Bolts on the dead or short end of the rope? (h)(2)(v)

Is the spacing and number of all types of clips in accordance with the clip manufacturer's recommendation? (h)(2)(v)

Are such clips drop-forged steel in all sizes manufactured commercially? (h)(2)(v)

When a newly installed rope has been in operation for an hour, are all nuts on the clip bolts retightened? (h)(2)(v)

Are swaged or compressed fittings applied as recommended by the rope or crane manufacturer? (h)(2)(vi)

Wherever ropes can be exposed to temperatures at which fiber cores could be damaged, are ropes having an independent wire-rope or wire-strand core, or other temperature-damage resistant cores used? (h)(2)(vii)

Are all replacement ropes of the same size, grade, and construction as the original rope furnished by the crane manufacturer? (h)(2)(viii)

Equalizers. (h)(3)

If a load is supported by more than one rope is the tension in the parts equalized? (h)(3)

Hooks. (h)(4)

Do all hooks meet the manufacturer's recommendations, and are precautions taken to insure that they are not over-loaded? (h)(4)

(i) Warning Device.

Is each crane equipped with a power traveling mechanism provided with a gong or other effective warning signal? (i)

Exception: Floor operated cranes.

(j) Inspection.

Inspection Classification. (j)(1)

Are all now and altered cranes inspected to insure compliance with the provisions of these items prior to initial use? (j)(1)(i)

Are procedures established to insure that frequent inspections are accomplished on a daily to monthly interval, depending upon the circumstances? (j)(1)(ii)

1910.179 — OVERHEAD AND GANTRY CRANES

YES NO

Are procedures established to insure that periodic inspections are accomplished on a one to twelve-month interval, depending upon the circumstances? (j)(1)(ii)

Frequent Inspection. (j)(2)

Are the following items inspected as required by the frequent inspection as listed above, or as specifically indicated, including observation during operation for any defects which might appear between regular inspections? (j)(2)

Are all deficiencies such as listed carefully examined, and is a determination made as to whether they constitute a safety hazard? (j)(2)

Are all functional operating mechanisms checked for maladjustment interfering with proper operation done on a daily basis? (j)(2)(i)

Are daily inspections or checks made to determine the deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of the air or hydraulic systems? (j)(2)(ii)

Are hooks given a visual inspection on a daily basis to determine whether there is any deformation or cracks? (j)(2)(iii)

Are hooks given a monthly inspection, and is there a certification record made for such inspection? (j)(2)(ii)

Does the certification record include a serial number or other identifier for the hook inspected, and is the certification record signed by the person who performed the inspection? **[Revised 1986]** (j)(2)(iii)

Are hooks with cracks discarded? (j)(2)(iii)

Are hooks with an increase of more than 15 percent of normal throat opening discarded? (j)(2)(iii)

Are hooks with more than a 10° twist from the plane of the unbent hook discarded? (j)(2)(iii)

Are all hoist chains, including end connections, inspected daily for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations? (j)(2)(iv)

Are all hoist or load attachment chains, including end connections, given a monthly inspection for the same, with a certification record? (j)(2)(iv)

Does the certification record include the date of inspection, the signature of the person who performed the inspection, and an identifier of the chain which was inspected? **[Revised 1986]** (j)(2)(iv)

[Reserved] (j)(2)(v)

Are all functional operating mechanisms given an inspection to determine excessive wear of components? (j)(2)(vi)

Is an inspection made of rope reeving to insure that manufacture's recommendations are being complied with? (j)(2)(vii)

Periodic Inspection. (j)(3)

Are cranes given a complete inspection at the intervals determined in the items under (j)(1)(ii) above? (j)(3)

Are such things as the activity of the crane, the severity of the service, and the environment given due regard in determining the interval for the periodic inspections? (j)(3)

Do the periodic inspections include all of the items under(2) above, in addition to the following items? (j)(3)

1910.179 — OVERHEAD AND GANTRY CRANES

		YES	NO
Are all members inspected to determine whether they have been deformed, cracked, or corroded?	(j)(3)(i)		
Are all bolts or rivets checked to determine if they are loose?	(j)(3)(ii)		
Are all sheaves and drums checked to determine whether they are cracked or worn?	(j)(3)(iii)		
Are all pins, bearings, shafts, gears, rollers, locking and clamping devices inspected to determine if they are worn, cracked, or distorted?	(j)(3)(iv)		
Are all brake system parts, linings, pawls, and ratchets inspected to determine if they have excessive wear?	(j)(3)(v)		
Are all load, wind, and other indicators inspected over their full range to determine if there are any significant inaccuracies?	(j)(3)(vi)		
Are all gasoline, diesel, electric or other powerplants inspected for improper performance of noncompliance with applicable safety requirements?	(j)(3)(vii)		
Are all chain drive sprockets and chains inspected to determine whether they have excessive wear or excessive chain stretch?	(j)(3)viii)		
[Reserved]	(j)(3)(ix)		
Is all electrical apparatus inspected for signs of pitting or any deterioration of controller contractors, limit switches and push-button stations?	(j)(3)(x)		
Cranes Not in Regular Use.	(j)(4)		
Are cranes which have been idle for more than one, but less than six months, given an inspection complying with the requirements of the items under (j)(2) above?	(j)(4)(i)		
Are the items under 1910.179(m)(2) complied with for inspection of wire rope on these cranes?	(j)(4)(i)		
Are cranes which have been idle for more than 6 months given a complete inspection covering the items in (2) and (3) above, in addition to the wire rope inspection required by the items under 1910.179(m)(2) before being placed in service?	(j)(4)(ii)		
Are standby cranes inspected at least semiannually, covering the items in paragraph (2) of this checklist in addition to the inspection required by 1910.179(m)(2)?	(j)(4)(iii)		
(k) Testing.			
Operational Tests.	(k)(1)		
Are all new and altered cranes tested to insure compliance with this section, including the following functions, prior to initial use: (a) Hoisting and lowering; (b) Trolley travel; (c) Bridge travel; (d) Limit switches, locking and safety devices?	(k)(1)(i)		
Is the trip setting of hoist limit switches determined by tests with an empty hook traveling in increasing speeds up to the maximum speed?	(k)(1)(ii)		
Is the actuating mechanism of the limit switch so located that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley?	(k)(1)(ii)		

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		YES	NO
Rated Load Test.	(k)(2)		
Are test loads limited to 125 percent of the rated load, unless otherwise recommended by the manufacturer?	(k)(2)		
Are test reports placed on file where readily available to appointed personnel?	(k)(2)		
(l) Maintenance.			
Preventive Maintenance.	(l)(1)		
Is there a preventive maintenance program established as required by the crane manufacturer's recommendations?	(l)(1)		
Maintenance Procedure.	(l)(2)		
Are the following precautions taken before adjustments and repairs are started on a crane: (a) Is the crane run to a location where it will cause the least interference with other cranes and operations in the area? (b) Are all controllers at the "off" position? (c) Is the main or emergency switch open and locked in the open position? (d) Are warning or "out of order" signs placed on the crane? Are such signs also placed on the floor beneath the crane, or on the hook where visible from the floor? (e) Are rail stops or other suitable means provided where other cranes are in operation on the some runway?			
After adjustments and repairs have been made, are precautions taken to insure that the crane will not be operated until all guards have been reinstalled and safety devices reactivated and maintenance equipment removed?	(l)(2)(ii)		
Adjustments and Repairs.	(l)(3)		
Are precautions taken to insure that any unsafe conditions disclosed by inspection are corrected before operation of the crane is resumed?	(l)(3)(i)		
Are adjustments and repairs accomplished only by designated personnel?	(l)(3)(i)		
Are adjustments maintained to assure correct functioning of components, such as limit switches, control systems, brakes, power plants, etc.?	(l)(3)(ii)		
Are repairs or replacements provided promptly as required for safe operation?	(l)(3)(iii)		
Are crane hooks that show defects as described in the item under 1910.179(j)(2)(iii) discarded?	(l)(3)(iii)(a)		
Is welding or reshaping of crane hooks generally discouraged?	(l)(3)(iii)(a)		
If such repairs are attempted, are they only done under the supervision of a competent person?	(l)(3)(iii)(a)		
If such repairs are accomplished, is the hook tested to the load requirements of paragraph (k)(2)?	(l)(3)(iii)(a)		
Are load attachment chains and rope slings showing defects repaired or replaced promptly?	(l)(3)(iii)(b)		
Are all critical parts which are cracked, broken, bent, or excessively worn repaired or replaced promptly?	(l)(3)(iii)(c)		
Are pendant control stations kept clean and are function labels kept legible?	(l)(3)(iii)(d)		

1910.179 — OVERHEAD AND GANTRY CRANES

YES NO

(m) Rope Inspection.

Running Ropes. (m)(1)

Is a thorough inspection of all ropes made at least once a month? (m)(1)

Is a full written, dated certification record of rope condition kept on file where readily available to appointed personnel? Does it include an identifier for the ropes which were inspected and is the certification record signed by the person who performed the inspection? [**Revised 1986**] (m)(1)

Is any deterioration, resulting in appreciable loss of original strength, such as described below, carefully noted and determination made as to whether further use of the rope would constitute a safety hazard:

(i) A reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires;

(ii) A number of broken outside wires and the degree of distribution or concentration of such broken wires;

(iii) Worn outside wires;

(iv) Corroded or broken weres at end connections;

(v) Corroded, cracked, bent, worn, or improperly applied end connections;

(vi) Severe kinking, crushing, cutting, or unstranding? (m)(1)

Other Ropes. (m)(2)

Is all rope which has been idle for a period of a month or more due to shutdown or storage of a crane on which it is installed given a thorough inspection before it is placed in service? (m)(2)

Does this inspection include determination of all types of deterioration, and is it performed by an appointed person whose approval is required for further use of the rope? (m)(2)

Is a written and dated certification record of the rope condition available for inspection? Does the certification record include an identifier for the rope which was inspected and was it signed by the person who performed the inspection? [**Revised 1986**] (m)(2)

(n) Handling the Load.

Size of Load. (n)(1)

Are precautions taken to insure that the crane will not be loaded beyond its rated load except for test purposes? (n)(1)

Attaching the Load. (n)(2)

Are precautions taken to inure that the hoist chain or hoist rope is free from kinks or twists and is not wrapped around the load? (n)(2)(i)

Is the load attached to the load block hook by means of slings or other approved devices? (n)(2)(ii)

Are precautions taken to insure that the sling clears all obstacles? (n)(2)(iii)

Moving the Load. (n)(3)

Are precautions taken to insure that the load is secured and properly balanced in the sling or lifting device before it is lifted more than a few inches? (n)(3)(i)

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YES NO

Before starting to hoist, are the following conditions noted:

(a) That the hoist rope is not kinked;

(b) That multiple part lines are not twisted around each other;

(c) That the hook is brought over the load in such a manner as to prevent swinging?(n)(3)(ii)

While hoisting the load, is care taken that:

(a) There is no sudden acceleration or deceleration of the moving load;

(b) The load does not contact any obstructions? (n)(3)(iii)

Are procedures established whereby cranes will not be used for side pulls except when specifically authorized by a responsible person? (n)(3)(iv)

Has such responsible person determined that the stability of the crane is not thereby endangered and that various parts of the crane will not be overstressed? (n)(3)(iv)

Are precautions taken to insure that there is no hoisting, lowering, or traveling while any employee is on the load or hook? (n)(3)(v)

Are precautions established to insure that the operator will avoid carrying loads over people? (n)(3)(vi)

Are procedures established whereby the operator will test the brakes each time a load approaching the rated load is handied? (n)(3)(vii)

Is such testing of the brakes accomplished by raising the load a few inches and applying the brakes? (n)(3)(vii)

Are precautions taken to insure that the load will not be lowered to such a degree that there will be less than two full wraps of rope remaining on the hoisting drum? (n)(3)(viii)

When two or more cranes are used to lit a load, are procedures established to insure that one responsible person will be in charge of the operation? (n)(3)(ix)

Does such responsible person analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made? (n)(3)(ix)

Are procedures established whereby the operator will not leave his position at the controls while the load is suspended? (n)(3)(x)

Are instructions given to operators that when the bridge is started or when the load or hook approaches near or over personnel, the warning signal will be sounded? (n)(3)(xi)

Hoist Limit Switch. (n)(4)

Is each operator required to test the upper limit switch at the start of each shift? (n)(4)(i)

Are instructions given to insure that the operators will exercise extreme care in testing the limit switch? (n)(4)(i)

Are instructions given to insure that if the limit switch does not operate, an appointed person will be immediately notified? (n)(4)(i)

Are instructions given to operators to insure that the hoist limit switch, which controls the upper limit of travel, will never be used as an operating control? (n)(4)(ii)

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YES NO

(o) Other Requirements, General.

Ladders. (o)(1)

Are procedures and instructions established to insure that hands are free from encumbrances while personnel are using ladders? (o)(1)(i)

Are procedures established whereby articles which are too large to be carried in pockets or belts will be lifted and lowered by handline? (o)(1)(ii)

Cabs. (o)(2)

Is all necessary clothing and personal belongings stored in such a manner so as not to interfere with access or operation? (o)(2)(i)

Are all tools, oil cans, waste, extra fuses, and other necessary articles stored in the tool box, and are they prohibited from lying around loose in or about the cab? (o)(2)(ii)

Fire Extinguishers. (o)(3)

Are procedures established and instructions provided to insure that operators are familiar with the operation and care of fire extinguishers that are provided? (o)(3)

1910.180 — CRAWLER LOCOMOTIVE AND TRUCK CRANES

[**Note:** parts of this section have been revised, as indicated]

(b) General Requirements.

Application. (b)(1)

The following items apply to crawler cranes, locomotive cranes, wheel mounted cranes of both truck and self-propelled wheel type,' and any variations thereof which retain the same fundamental characteristics. (b)(1)

The following items do not apply to cranes designed for railway and automobile wreck clearances. (b)(1)

The following items apply only to machines when used as lifting cranes. (b)(1)

New and Existing Equipment. (b)(2)

Do all crawler, locomotive and truck cranes constructed and utilized on or after August 31, 1971, meet the design specifications of ANSI B30.5-1968? (b)(2)

Have all crawler, locomotive, and truck cranes constructed prior to August 31, 1971, been modified to conform to ANSI 830.5, unless it can be shown that the crane cannot feasibly or economically be altered and that the crane substantially complies with the requirements of this section? (b)(2)

Designated Personnel. (b)(3)

Are only designated personnel permitted to operate a crane covered by these items? (b)(3)

(c) Loading Ratings.

Load Ratings — Where Stability Governs Lifting Performance. (c)(1)

Are precautions taken to insure that load ratings will not exceed the following percentages for cranes, with the indicated types of mounting under conditions stipulated in the items in (ii) and (iii)? (c)(1)(i)

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YES NO

Type of Crone Mounting	**Maximum Load Ratings (percent of tipping loads)**
Locomotive, without outriggers:	
Booms 60 feet ot less	85
Booms over 60 feet	85[1]
Locomotive, using outriggers fully extends	80
Crawler, without outriggers	75
Crawler, using outriggers fully extended	85
Truck and wheel mounted without outriggers fully extended	85

[1] Unless this results in less than 30,000 pound0feet net stabilizing moment about the rail, which shall be minimum with such booms.

Are the following stipulations used in governing the application of the values in the items immediately above for locomotive cranes:

(a)Tipping with or without the use of outriggers occurs when half of the wheels farthest from the load leave the rail.

(b)The crane shall be standing an track which is level within 1 percent grade.

(c)Radius of the load is the horizontal distance from a projection of the axis of rotation to the rail support surface, before loading, to the center of vertical hoist fine or tackle with load applied. (c)(1)(ii)

In applying the values as indicated in subdivision (i) above, for crawler, truck, and wheel-mounted cranes, is the Crane Load-Stability Test Code, Society of Automotive Engineers (SAE) J765, used? (c)(1)(iii)

Is the effectiveness of these preceding stability factors influenced by such additional factors as freely suspended loads, track, wind, or ground conditions, condition and inflation of rubber tires, boom lengths, proper operating speeds for existing conditions, and, in general, careful and competent operation? (c)(1)(iv)

Are all of the items immediately above taken into account by the user of the crane? (c)(1)(iv)

Is there a substantial and durable rating chart with clearly legible letters and figures provided with each crane, and securely fixed to the crane lab in a location easily visible to the operator while seated at his control station? (c)(2)

(d) Inspection Classification.

Initial Inspection. (d)(1)

Are all new and altered cranes inspected to insure compliance with the provisions of this section, prior to initial use? (d)(1)

Regular Inspection. (d)(2)

Are inspection procedures for cranes in regular service divided into two general classifications, based upon the intervals at which inspection should be performed? (d)(2)

Are procedures established whereby inspections will be done on a daily to monthly interval for frequent inspections, and in a 1-to 12-month interval for periodic inspections, or as specifically recommended by the manufacturer? (d)(2)

Frequent Inspection. (d)(3)

Are items such as the following inspected for defects at intervals as defined in "frequent inspections", or as specifically indicated, including observation during operation for any defects which might appear between regular inspections? (d)(3)

Are any such deficiencies that are listed carefully examined and a determination made as to whether they constitute a safety hazard? (d)(3)

Are daily inspections made on all control mechanisms for maladjustment interfering with proper operation? (d)(3)(i)

Are daily inspections made on all control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter? (d)(3)(ii)

Are daily inspections made to insure that safety devices will not malfunction? (d)(3)(iii)

Are daily inspections made to insure that there is no deterioration or leakage in air or hydraulic systems? (d)(3)(iv)

Are crane hooks inspected for deformations or cracks? (d)(3)(v)

Are hooks with cracks or having more than 15 percent in excess of normal throat opening, or more than 10° twist from the plane of the unbent hook removed from service? (d)(3)(v)

Are daily inspections made to insure that rope reeving will comply with manufacturer's recommendations? (d)(3)(vi)

Are regular inspections conducted on electrical apparatus to determine whether or not they will malfunction, and for signs of excessive deterioration, dirt, and moisture accumulation? (d)(3)(vii)

Periodic Inspection. (d)(4)

Are complete inspections of the crane performed at intervals as required in the items under subparagraph (2), depending upon its activity, severity of service, and environment, or as specifically, indicated in the following items? (d)(4)

Do such inspections also include the items listed above under (3)? (d)(4)

Are all deficiencies carefully examined and a determination made as to whether they constitute a safety hazard? (d)(4)

Is an inspection made to insure that there are no deformed, cracked, or corroded members in the crane structure and boom? (d)(4)(i)

Does such inspection include a determination as to whether or not there are loose bolts or rivets in the structure? (d)(4)(ii)

Does such inspection chock for cracked or worn sheaves and drums? (d)(4)(iii)

Does such inspection include pins, bearings, shafts, gears, rollers and locking devices to determine whether they are worn, cracked, or distorted? (d)(4)(iv)

Does such inspection include brake and clutch system parts, linings, pawls, and ratchets to determine whether there is excessive wear? (d)(4)(v)

Does such inspection include gasoline, diesel, electric, or other power plants for improper performance or noncompliance with safety requirements? (d)(4)(vi)

Does such inspection include load, boom angle, and other indicators over their full range, for any significant inaccuracies? (d)(4)(vii)

Does such inspection include chain-drive sprockets for excessive wear, and excessive chain stretch? (d)(4)(viii)

Does such inspection include travel steering, braking, and locking devices to determine that they will not malfunction? (d)(4)(ix)

Does such inspection include tires to insure that they are not excessively worn or damaged? (d)(4)(x)

Cranes Not in Regular Use. (d)(5)

Are all cranes which have been idle for a period of one to 6 months given an inspection conforming with the items under (3) above? (d)(5)(i)

Does such inspection include the items contained in (g)(2)(ii), which follows in normal sequence in this checklist? (d)(5)(i)

Are all cranes which have been idle for a period of six months or more given a complete inspection conforming with the requirements of (3) and (4) above, and the items under (g)(2)(ii) of this section before being placed back into service? (d)(5)(ii)

Are all cranes inspected at least semiannually in accordance with the requirements of the items under (3) above, and (g)(2)(ii) which follows in normal sequence? (d)(5)(iii)

Are cranes which are exposed to adverse environment inspected more frequently? (d)(5)(iii)

Inspection Records. (d)(6)

Are procedures established whereby written, dated, and signed inspection certification records will be made monthly on critical items in use such as brakes, crane hooks and ropes?

Is the serial number, or other identifier, of the crane which was inspected included? Are such records kept readily available? [**Revised 1986**] (d)(6)

(e) Testing.

Operational Tests. (e)(1)

Are procedures established to insure that each new production crane will be tested by the manufacturer to the extent necessary to insure compliance with the operational requirements of this paragraph, including functions such as the following:

(a) Load hoisting and lowering mechanisms;

(b) Boom hoisting and lowering mechanisms;

(c) Swinging mechanism;

(d) Travel mechanism;

(e) Safety devices? (e)(1)(i)

In cases where the complete production crane is not supplied by one manufacturer, are such tests conducted after final assembly? (e)(1)(ii)

Are certified production-crane test results available? (e)(1)(iii)

Rated Load Test. (e)(2)

Are written reports available showing the test procedures and confirming the adequacy of repairs or alterations? (e)(2)(i)

Are test loads limited to 110 percent of the rated load at any selected working radius? (e)(2)(ii)

T2

Where rerating of cranes is necessary, are the following items complied with:

(a) Are crawler, truck, and wheel-mounted cranes tested in accordance with SAE Recommended Practice, Crane Load Stability Test Code J765 (April 1961)?

(b) Are locomotive cranes tested in accordarice with the items under paragraph 1910.180(c)(1)(i) and (ii) of this checklist?

(c) Are rerating test reports readily available for inspection? **(e)(2)(iii)**

Are cranes prohibited from being rerated in excess of the original load ratings, unless such rating changes are approved by the crane manufacturer or final assembler? **(e)(2)(iv)**

(f) Maintenance Procedure — General.

Are cranes prohibited from being operated after adjustments and repairs have been made until the following have been complied with:

(a) All guards have been reinstalled;

(b) Safety devices have been reactivated;

(c) Maintenance equipment has been removed from the crane?

(g) Rope Inspection.

Running Ropes. **(g)(1)**

Is a thorough inspection of all ropes in use made at least once a month, and is a full written, dated, and signed certification record of rope condition kept on file where it is readily available? [**Revised 1986**] **(g)(1)**

Does the certification record include an identifier for the ropes inspected? [**Revised 1986**] **(g)(1)**

Are all inspections performed by an appointed or authorized person? **(g)(1)**

Are any deteriorations resulting in appreciable loss of original strength, carefully noted and a determination made as to whether further use of the rope would constitute a safety hazard? **(g)(1)**

Are the following items used to determine loss of original strength:

(i) A reduction of rope diameter below nominal diameter, due to loss of care support, internal or external corrosion, or wear of outside wires;

(ii) A number of broken outside wires and the degree of distribution of concentration of such broken wires;

(iii) Worn outside wires;

(iv) Corroded or broken wires at end connections;

(v) Corroded, cracked, bent, worn, or improperly applied end connections;

(vi) Severe kinking, crushing, cutting, or unstranding? **(g)(1)**

Other Ropes. **(g)(2)**

Is particular care taken to inspect ropes other than running ropes that come in contact with equalizer sheaves, or other sheaves where rope travel is limited, or with saddles? **(g)(2)(i)**

Is all rope which has been idle for a period of a month or more due to shutdown or storage of a crane, given a thorough inspection before it is placed in service? **(g)(2)(ii)**

Does this inspection include all types of deterioration? **(g)(2)(ii)**

Is this inspection performed by an appointed or authorized person whose approval shall be required for further use of the rope? **(g)(2)(ii)**

Is a written and dated certification record of the rope condition available? **(g)(2)(ii)**

Does the certification record include an identifier for the rope that was inspected and is the certification record signed by the person who performed the inspection? [**Revised 1986**] **(g)(2)(ii)**

(h) Handling the Load.

Size of Load. **(h)(1)**

Are precautions taken to insure that no crane will be loaded beyond the rated load, except for test purposes? **(h)(1)(i)**

When loads which are limited by structural competence rather than by stability are handied, is the weight of the load determined within plus or minus 10 percent before it is lifted? **(h)(1)(ii)**

Attaching the Load. **(h)(2)**

Are precautions taken to insure that the hoist rope will not be wrapped around the load? **(h)(2)(i)**

Are all loads attached to the hook by means of slings or other approved devices? **(h)(2)(ii)**

Moving the Load. **(h)(3)**

Has the employer or his representative assured himself that the following two items are complied with in moving a load:

(a) That the crane is level and where necessary blocked properly?

(b) The load is well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches? **(h)(3)(i)**

Before starting to hoist the load, is the operator required to insure that the following conditions are noted:

(a) That the hoist rope is not kinked;

(b) That multiple part lines will not be twisted around each other;

(c) That the hook will be brought over the load in such a manner as to prevent swinging;

Are operators required to insure that the following items are in compliance during hoisting of a load:

(a) That there is no sudden acceleration or deceleration of the moving load;

(b) That the load does not contact any obstructions? **(3)(iii)**

Is side loading of booms limited to only freely suspended loads? **(h)(3)(iv)**

Are cranes prohibited from being used for dragging loads sideways? **(h)(3)(iv)**

Is hoisting, lowering, swinging, or traveling prohibited while anyone is on the load or hook? **(h)(3)(v)**

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	YES	NO
Is the operator cautioned that he should avoid carrying loads over people? **(h)(3)(vi)**		
On truck-mounted cranes, is the lifting of loads over the front area prohibited, except as approved by the crane manufacturer? **(h)(3)(vii)**		
Is the operator required to test the brakes each time a load approaching the rated load is handled by raising it a few inches and applying the brakes? **(h)(3)(viii)**		
Are outriggers required to be used when the load to be handled at that particular radius exceeds the rated load without outriggers, as given by the manufacturer for that crane? **(h)(3)(ix)**		
Where floats are used, are they securely attached to the outriggers? **(h)(3)(ix)**		
When wood blocks are used to support outriggers are they: (a) Strong enough to prevent crushing, (b) Free from defects, (c) Of sufficient width and length to prevent shifting or toppling under load? **(h)(3)(ix)**		
Are precautions taken to insure that neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective beams? **(h)(3)(x)**		
Before lifting loads with locomotive cranes without using the outriggers, are means taken to prevent the load from being carried by the truck springs? **(h)(3)(xi)**		
When two or more cranes are used to lift one load, is there one designated person responsible for the operation? **(h)(3)(xii)**		
Is this one designated person required to analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made? **(h)(3)(xii)**		
Are the following additional precautions exercised when the crane is in transit: (a) Is the boom carried in line with the direction of motion? (b) Is the superstructure secured against rotation, except when negotiating turns when there is an operator in the cab or the boom is supported on a dolly? (c) Is the empty hook lashed or otherwise restrained so that it cannot swing freely? **(h)(3)(xiii)**		
Before traveling a crane with a load, is a designated person responsible for determining and controlling safety? **(h)(3)(xiv)**		
Does such responsible person make the determinations, such as the positioning of the load, the boom location, the ground support, the travel route, and the speed of the movements? **(h)(3)(xiv)**		
Is the traveling of a crane with the boom so high that it may bounce back over the cab prohibited? **(h)(3)(xv)**		
When rotating the crane, are the operators cautioned that sudden starts and stops must be avoided? **(h)(3)(xvi)**		
Are rotational speeds such that the load does not swing out beyond the radii at which it can be controlled? **(h)(3)(xvi)**		
Is a tag or restraint line used when rotation of the load is hazardous? **(h)(3)(xvi)**		
When a crane is to be operated at a fixed radius, is the boom-hoist pawl or other positive locking device engaged? **(h)(3)(xvii)**		

1910.180 — CRAWLER LOCOMOTIVE AND TRUCK CRANES

	YES	NO
Are ropes prohibited from being handled on a winch head without the knowledge of the operator? **(h)(3)(xviii)**		
While a winch hood is being used, is the operator within convenient reach of the power unit control lever? **(h)(3)(xix)**		
Holding the Load. **(h)(4)**		
Is the operator prohibited from leaving his position at the controls while the load is suspended? **(h)(4)(i)**		
Are all persons prohibited from standing or passing under a load on the hook? **(h)(4)(ii)**		
If the load is to remain suspended for any considerable length of time, is the operator required to hold the drum from rotating in the lowering direction by activating the positive controllable means of the operator's station? **(h)(4)(iii)**		
(i) Other Requirements.		
Rail Clamps. **(i)(1)**		
Is the use of rail clamps prohibited as a means of restraining tipping of a locomotive crane? **(i)(1)**		
Ballast or Counterweight. **(i)(2)**		
Are cranes prohibited from being operated without the full amount of any ballast or counterweight in place as specified by the maker? **(i)(2)**		
Are precautions taken to insure that the ballast or counterweight in place is as specified by the manufacturer and is not to be exceeded? **(i)(2)**		
Cabs. **(i)(3)**		
Are instructions given to insure that necessary clothing and personal belongings are stored in such a manner as to not interfere with access or operation? **(i)(3)(i)**		
Are all tools, oil cans, waste, extra fuses, and other necessary articles stored in the tool box, and prohibited from being allowed to lie loose in or about the cab? **(i)(3)(ii)**		
Refueling. **(i)(4)**		
When refueling with small portable containers, are such containers approved safety type cans equipped with an automatic closing cap and flame arrester? For a definition of "approved," refer to section 1910.155 (c)(3), which can be found in section L of the Merritt OSHA Reference Manual. [**Revised 1988**] **(i)(4)(i)**		
Are machines prohibited from being refueled with the engine running? **(i)(4)(ii)**		
Fire Extinguishers. **(i)(5)**		
Is a carbon dioxide, dry chemical, or equivalent fire extinguisher kept in the cab or vicinity of the crane? **(i)(5)(i)**		
Are all operating and maintenance personnel made familiar with the use and care of the fire extinguishers provided? **(i)(5)(ii)**		
Swinging Locomotive Cranes. **(i)(6)**		
Are locomotive cranes prohibited from being swung into a position where railway cars on an adjacent track might strike them? **(i)(6)**		
Exception: When it has been ascertained that cars are not being moved on the adjacent track and proper flag protection has been established.		

1910.180 — CRAWLER LOCOMOTIVE AND TRUCK CRANES

YES NO

(j) Operating Near Electric Power Lines.

Clearances.

If electrical distribution and transmission lines have not been deenergized and visibly grounded at a point of work, or where insulating barriers not a part of the crane have not been erected to prevent physical contact with the lines, are operators and supervisors required to maintain the following distances under, over, by or near powerlines when cranes are working: **(j)(1)**

For lines rated 50 kv. or below, is the minimum clearance between the lines and any part of the crane or load kept to at least 10 feet? **(j)(1)(i)**

For lines rated over 50 kv. minimum, is the clearance between the lines and any part of the crane or load kept to at least 10 feet plus 0.4 inch for each l kv. over 50 kv., or twice the length of the line insulator but never less than 10 feet? **(j)(1)(ii)**

When the crane is in transit with no load and boom lowered, is the clearance a minimum of 4 feet? **(j)(1)(iii)**

Boom Guards. **(j)(2)**

If cage-type boom guards, insulating links, or proximity warning devices are used on cranes, are operators and supervisors still required to maintain the distances as outlined in (1) above? **(j)(2)**

Notification. **(j)(3)**

Are the owners of the lines or their authorized representatives notified and provided with all pertinent information prior to the commencement of operations near electrical lines? **(j)(3)**

Overhead Wires. **(j)(4)**

Is any overhead wire considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line? **(j)(4)**

1910.181 — DERRICKS

[**Note**: parts of this section have been revised, as indicated]

(b) General Requirements.

Application. **(b)(1)**

The following items apply to "guy," "stiffleg," "basket," "breast," "gin pile," "Chicago boom," and "A-frame" derricks of the stationary type. The requirements of this section also apply to any modification of these types which retain their fundamental features, except for floating derricks. **(b)(i)**

New and Existing Equipment. **(b)(2)**

Do all derricks constructed and installed on or after August 31, 1971 meet the design specifications of ANSI B30.6-1969? **(b)(2)**

Designated Personnel. **(b)(3)**

Are only designated personnel permitted to operate a derrick? **(b)(3)**

(c) Load Ratings.

Rated Load Marking. **(c)(1)**

Have all permanently installed derricks with fixed lengths of boom, guy, and mast been provided with a substantial, durable, and clearly legible rating chart? **(c)(1)**

1910.181 — DERRICKS

YES NO

Is such chart securely affixed where it isvisible to personnel responsible for the safe operation of the equipment? **(c)(1)**

Is the following information included on the chart? **(c)(1)**

The manufacturer's approved load ratings at corresponding ranges of boom angle or operating radii? **(c)(1)(i)**

The specific lengths of the components on which the load ratings are based? **(c)(1)(ii)**

The required parts for hoist reeving? **(c)(1)(iii)**

Nonpermanent Installations. **(c)(2)**

For nonpermanent installations has the manufacturer provided sufficient information from which capacity charts can be prepared for the particular installation? **(c)(2)**

Are such capacity charts located at the derricks or at the jobsite office? **(c)(2)**

(d) Inspection.

Inspection Classification. **(d)(1)**

Prior to initial use, have all new and altered derricks been inspected to insure compliance with the provisions of this section? **(d)(1)(i)**

Are frequent inspections as required by the appropriate parts of this checklist done on a daily to monthly interval? **(d)(1)(ii)**

Are periodic inspections as required by parts following in this checklist done on a 1-to 12-month interval? **(d)(1)(ii)**

Frequent Inspection. **(d)(2)**

Are items such as the following inspected for defects at intervals as required, or as specifically indicated, including observation during operation for any defects which might appear between regular inspections? **(d)(2)**

Are deficiencies carefully examined for any safety hazard? **(d)(2)**

Are all control mechanisms inspected daily for adjustment, wear, and lubrication? **(d)(2)(i)**

Are all chords and lacing inspected daily, visually? **(d)(2)(ii)**

Is the tension in guys inspected daily? **(d)(2)(iii)**

Is the plumb of the mast inspected? **(d)(2)(iv)**

Is a daily inspection conducted to determine deterioration or leakage in air or hydraulic systems? **(d)(2)(v)**

Are derrick hooks inspected for deformations or cracks? **(d)(2)(vi)**

Are hooks with cracks or having more than 15 pertent in excess of normal throat opening, or more than 10° twist from the plane of the unbent hook discarded? **(d)(2)(vi)**

Is a visual inspection accomplished for noncompliance with rope reeving in accordance with derrick manufacturer's recommendations? **(d)(2)(vii)**

Are hoist brakes, clutches, and operating levers checked daily for proper functioning before beginning operations? **(d)(2)(viii)**

Is electrical apparatus checked for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation? **(d)(2)(ix)**

T2

1910.181 — DERRICKS

YES NO

Periodic Inspection. (d)(3)

Is a complete inspection of the derrick performed at intervals as generally defined in (1)(ii)(b) of this checklist, depending upon its activity, severity of service, and environment, or as specifically indicated below? (d)(3)(i)

Do these inspections also include the items in (2) above, in addition to the following items? (d)(3)(i)

Are deficiencies carefully examined and a determination made as to whether they constitute a safety hazard:

(a) Structural members for deformations, cracks, and corrosion.

(b) Bolts or rivets for tightness.

(c) Parts such as pins, bearings, shafts, gears, sheaves, drums, rollers, locking and clamping devices, for wear, cracks, and distortion.

(d) Gudgeon pin for cracks, wear, and distortion each time the derrick is to be erected.

(e) Powerplents for proper performance and compliance with applicable safety requirements.

(f) Hooks: (d)(3)(i)

Are foundations or supports inspected for continued ability to sustain the imposed loads? (d)(3)(ii)

Derricks Not in Regular Use. (d)(4)

Are derricks which have been idle for a period of 1 month or more, but less than 6 months, given an inspection conforming with the items under paragraph (2) of this checklist, in addition to the running ropes being given an inspection asreauired by the itemsunder 1910.181(9)(3)? (d)(4)(i)

Are derricks which have been idle for a period of more than 6 months given a complete inspection conforming with all items under paragraphs (2) and (3) above, in addition to the running rope requirementsunderparagraph 1910.181(g)(3)? (d)(4)(ii)

Are standby derricks inspected at least semiannually in accordance with the requirements of the items under paragraph (2) above, in addition to the running rope requirements under paragraph 1910.181 (g)(3)? (d)(4)(iii)

(e) Testing.

Operational Tests.

Prior to initial use are all new and altered derricks tested to insure compliance with this section, including the following functions:

(i) Load hoisting and lowering;

(ii) Boom up and down;

(iii) Swing;

(iv) Operation of clutches and brakes of hoist? (e)(1)

Anchorages. (e)(2)

Are all anchorages approved by the appointed person? (e)(2)

(f) Maintenance.

Preventive Maintenance. (f)(1)

Has a preventive maintenance program based on the derrick manufacturer's recommendations been established? (f)(1)

1910.181 — DERRICKS

YES NO

Maintenance Procedure. (f)(2)

Before adjustments and repairs are started on a derrick, are the following precautions taken?

(a) Is the derrick to be repaired arranged so it will cause the least interference with other equipment and operations in the area?

(b) Are all hoist drum dogs engaged?

(c) If an electric hoist is used, is the main or emergency switch locked in the open position?

(d) Are warning or out of order signs placed on the derrick and hoist?

(e) If repairs are to be made on booms of derricks are they made when the booms are lowered and adequately supported or when the booms are safely tied off?

(f) Is there a good communication system sat up between the hoist operator and the appointed individual in charge of derrick operations before any work on the equipment is started?

After adjustments and repairs have been made are precautions taken to insure that the derrick will not be operated until all guards have been reinstalled, safety devices reactivated, and maintenance equipment removed? (f)(2)(ii)

Adjustments and Repairs. (f)(3)

Are all unsafe conditions disclosed by inspection corrected before operation of the derrick is resumed? (f)(3)(i)

Are all adjustments maintained to assure correct functioning of components? (f)(3)(ii)

Are repairs or replacements provided promptly as needed for safe operation? (f)(3)(iii)

The following are examples of conditions requiring prompt repair or replacement:

Hooks with cracks or having more than 15 percent in excess of normal throat opening, or more than 10° twist from the plane of the unbent hook must be discarded. (f)(3)(iii)

(g) Rope Inspection.

Running Ropes. (g)(1)

Is a thorough inspection of all running ropes made at least monthly? (g)(1)

Is a written, dated certification record, signed by the person performing the inspection, identifying the ropes that were inspected, kept on file and readily available? [**Revised 1986**] (g)(1)

Are all deteriorations that result in appreciable loss of strength carefully noted and removed from service if required? (g)(1)

Some of the conditions that could result in an appreciable loss of strength are the following:

Is there a reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires? [**Revised 1986**] (g)(1)(i)

Are there a number of broken outside wires and what is the degree of distribution or concentration of these broken wires? [**Revised 1986**] (g)(1)(ii)

Are there worn outside wires? [**Revised 1986**] (g)(1)(iii)

Are there corroded or broken wires at end connections? **[Revised 1986]** (g)(1)(iv)

Are there corroded, cracked, bent, worn or improperly applied end connections? **[Revised 1986]** (g)(1)(v)

Is there severe kinking, crushing, cutting, or unstranding?**[Revised 1986]** (g)(1)(vi)

Limited Travel Ropes. (g)(2)

May heavy wear and/or broken wires occur in sections in contact with equalizer sheaves or other sheaves where rope travel is limited, or where they are provided with saddles? (g)(2)

Idle Ropes. (g)(3)

Is all rope which has been idle for a period of a month or more due to shutdown or storage of a derrick on which it is installed given a thorough inspection before it is placed in service? (g)(3)

Is this inspection for all types of deterioration? (g)(3)

Is a written, signed and dated certification record, identifying the ropes which were inspected, kept readily available? **[Revised 1986]** (g)(3)

Nonrotation Ropes. (g)(4)

Is particular care taken in the inspection of nonrotating rope? (g)(4)

(h) Operations of Derricks.

Are derrick operations directed only by the individual specifically designated for that purpose? (h)

(i) Handling the Load.

Size of Load. (i)(1)

Are precautions taken to insure that no derrick will be loaded beyond the rated load? (i)(1)(i)

When loads approaching the rrraximum rating of the derrick are to be handled, is it ascertained that the weight of the load has been determined within plus or minus 10 percent before it is lifted? (i)(1)(ii)

Attaching the Load. (i)(2)

Are precautions taken to insure that the hoist rope will not be wrapped around the load? (i)(2)(i)

Is the load attached to the hook by means of slings or other suitable devices? (i)(2)(ii)

Moving the Load. (i)(3)

Is the load wyell secured and properly balanced in the sling or lifting device before it is lifted more then a few inches? (i)(3)(i)

Are the following conditions noted before starting to hoist:

(a) That the hoist rope will not be kinked.

(b) That multiple part lines will not be twisted around each other.

(c) That the hook is brought over the load in such a manner as to prevent swinging.

During hoisting of the load, is the following care taken:

(a) That there is no sudden acceleration or deceleration of the moving load;

(b) That the load does not contact any obstructions? (3)(iii)

Are derricks prohibited from being used for side loading, except when specifically authorized by a responsible person who has determined that the various structural components will not be overstressed? (i)(3)(iv)

Are precautions taken to insure that no hoisting, lowering, or swinging will be done while anyone is on the load or hook? (i)(3)(v)

Is the operator cautioned about avoiding carrying loads over people? (i)(3)(vi)

Is the operator required to test the brakes each time a load approaching the rated load is handled, by raising it a few inches and applying the brakes? (i)(3)(vii)

Are precautions taken to insure that the load or boom will not be lowered below the point where less than two full wraps of rope remain on their respective drums? (i)(3)(viii)

Are operators cautioned about making sudden starts or stops when rotating a derrick? (i)(3)(ix)

Are operators cautioned that rotational speed shall be such that the load will not swing out beyond the radius at which it can be controlled? (i)(3)(ix)

Are precautions taken to insure that boom and hoisting rope systems will not be twisted? (i)(3)(x)

Holding the Load. (i)(4)

Are operators prohibited from leaving the control position while the load is suspended? (i)(4)(i)

Are employees prohibited from standing or passing under a load on the hook? (i)(4)(ii)

If conditions are such that the load must remain suspended for any considerable length of time is a dog, or pawl and ratchet, or other equivalent means provided to hold the load, rather than the brake alone? (i)(4)(iii)

Use of Winch Heads. (i)(5)

Are ropes handied on a winch head only with the knowledge of the operator? (i)(5)(i)

While a winch head is being used, is the operator required to be within convenient reach of the power unit control lever?

Securing Boom.

Are dogs, pawls, or other positive holding mechanism on the hoist engaged when securing the boom? (i)(6)

When not in use, is the derrick boom: (i) Laid down, (ii) secured to a stationary member, as nearly under the head as possible by attachment of a sling to the load block; or (iii) hoisted to a vertical position and secured to the mast? (i)(6)

(j) Other Requirements

Guards.

Are all exposed moving parts, such as gears, ropes, set screws, projecting keys, chains, chain sprockets, and reciprocating components, which constitute a hazard under normal operating conditions, guarded? (j)(1)(i)

Are guards securely fastened? (j)(1)(ii)

Is each guard capable of supporting without permanent distortion, the weight of a 200-pound person unless the guard is located where it is impossible for a person to step on it?

1910.181 — DERRICKS	YES	NO
Hooks. (j)(2)		
Do hooks meet the manufacturer's recommendations and are they prohibited from being overloaded? (j)(2)(i)		
Are safety latch type hooks used wherever possible? (j)(2)(ii)		
Fire Extinguishers. (j)(3)		
Is a carbon dioxide, dry chemical, or equivalent fire extinguisher kept in the immediate vicinity of the derrick? (j)(3)(i)		
Are operating and maintenance personnel familiar with the use and care of the fire extinguishers provided? (i)(3)(ii)		
Refueling. (j)(4)		
When refueling with portable containers, are such containers approved safety type containers equipped with automatic closing cap and flame arrester? For a definition of "approved," refer to section 1910.155 (c)(3), which can be found in section L of the Merritt OSHA Reference Manual. [**Revised 1988**] (j)(4)(i)		
When refueling operations are in progress, are engines required to be shut down? (j)(4)(ii)		
Operating Near Electric Powerlines. (j)(5)		
If electrical distribution and transmission lines have not been deenergized and visibly grounded at a point of work, or where insulating barriers not a part of the crane have not been erected to prevent physical contact with the lines, are operators and supervisors required to maintain the following distances under, over, by, or near powerlines when cranes are working? (j)(5)(i)		
For lines rated 50 kv. or below, is the minimum clearance between the lines and any part of the crane or load kept to at least 10 feet? (j)(5)(i)(a)		
For lines rated over 50 kv. minimum, is the clearance between the lines and any part of the crane or load kept to at least 10 feet plus 0.4 inch for each l kv. over 50 kv., or twice the length of the line insulator but never less than 10 feet? (j)(5)(i)(b)		
When the crane is in transit with no load and boom lowered, is the clearance a minimum of 4 feet? (j)(5)(i)(c)		
If cage-type boom guards, insulating links, or proximity warning devices are used on cranes, are operators and supervisors still required to maintain the distances as outlined in (i) above? (j)(5)(ii)		
Are the owners of the lines or their authorized representatives notified and provided with all pertinent information prior to the commencement of operations near the electrical lines? (j)(5)(iii)		
Is any overhead wire considered to be an eneraized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line? (j)(5)(iV)		
Cab or Operating Enclosure. (j)(6)		
Are necessary clothing and personal belongings stored in such a manner as to not interfere with access or operation?		
Are all tools, oil cans, waste, extra fuses, and other necessary articles stored in the toolbox, and prohibited from being allowed to lie loose in or about the cab or operating enclosure? (j)(6)(ii)		

1910.183 — HELICOPTERS	YES	NO
(a) Helicopter Regulations.		
Are applicable regulations of the Federal Aviation Administration complied with in Helicopter Crane Operations? **(a)**		
(b) Briefing.		
Is a briefing conducted prior to each day's operation? **(b)**		
Does the briefing set forth the plan of operation for the pilot and ground personnel? **(b)**		
(c) Slings and Tag Lines.		
Are loads properly slung? **(c)**		
Are tag lines of a length that will not permit their being drawn up into the rotors? **(c)**		
Is a pressed sleeve, swedged eyes or equivalent means used for all freely suspended loads to prevent hand splices from spinning open or cable clamps from loosening? **(c)**		
(d) Cargo Hooks.		
Is the electrical activating device of all electrically operated cargo hooks so designed and installed as to prevent inadvertent operations? **(d)**		
In addition, are these cargo hooks equipped with an emergency mechanical control for releasing the load? **(d)**		
Does a competent person, prior to each day's operation, test the hooks to ensure that the release functions properly both electrically and mechanically? **(d)**		
(e) Personal Protective Equipment.		
Are employees who receive the load wearing complete eye protection and hardhats secured by chinstraps? (employer provides) **(e)(1)**		
Is loose-fitting clothing likely to flap in rotor downwash, and thus be snagged on the hoist line, prohibited? **(e)(2)**		
(f) Loose Gear and Objects.		
Are necessary precautions taken to protect employees from flying objects in the rotor downwash? **(f)**		
Is all loose gear secured or removed within 100 feet of the place of lifting the load or depositing the load, or within all other areas susceptible to rotor downwash? **(f)**		
(g) Housekeeping.		
Is good housekeeping maintained in all helicopter loading and unloading areas? **(g)**		
(h) Load Safety.		
Is the size and weight of loads, and the manner in which loads are connected to the helicopter checked? **(h)**		
Is a lift stopped if the helicopter operator believes the lift cannot be made safely? **(h)**		
(i) Hooking and Unloading Loads.		
Are employees prohibited from performing work under hovering craft except when necessary to hook or unhook loads? **(i)**		
When employees perform work under hovering craft, is a safe means of access provided for employees to reach the hoist line hook and engage or disengage cargo slings? **(i)**		

YES NO

1910.183 — HELICOPTERS

(j) Static Charge

Is the static charge on a suspended load dissipated with a grounding device before ground personnel touch the suspended load? (Not required if protective rubber gloves are being worn by all ground personnel.) (j)

(k) Weight Limitation.

Is the weight of an external load limited to the helicopter manufacturer's rating? (k)

(l) Ground Lines.

Are hoist wires or other gear kept free from any fixed ground structure? (Pulling lines or conductors that are allowed to "pay out" from a container or roll off a reel are excepted.) (l)

(m) Visibility.

Are ground personnel instructed and required to exercise special caution to keep clear of main and stabilizing rotors when visibility is reduced by dust or other conditions? (m)

Are precautions taken, as far as practicable, to eliminate the dust or other conditions reducing the visibility? (m)

(n) Signal Systems.

Are the aircrew and ground personnel instructed on the signal system to be used and is the system reviewed with the employees in advance of hoisting the load? (Applies to both radio and hand signal systems) (n)

Are hand signals, where used, in conformance with Figure N-1? (See Self-Inspection Appendix) (n)

(o) Approach Distance.

Are employees prohibited from approaching within 50 feet of the helicopter when the rotor blades are turning, unless their work duties require their presence in that area? (o)

(p) Approaching Helicopter.

Have employees been instructed and is it enforced that whenever approaching or leaving a helicopter which has its blades rotating, all employees shall remain in full view of the pilot and keep in a crouched position? (p)

Are employees prohibited to work in the area from the cockpit or cabin *rearward while blades are rotating, unless authorized by the helicopter operator to work there? (p)

(q) Personnel.

Are sufficient ground personnel provided to ensure that helicopter loading and unloading operations can be performed safely? (q)

(r) Communications.

Is constant reliable communication provided between the pilot and the designated employee of the ground crew who acts as a signalman during the period of loading and unloading? (r)

Is this signalman clearly distinguishable from other ground personnel? (r)

(s) Fires.

Are open fires prohibited in areas where they could be spread by the rotor downwash? (s)

YES NO

1910.184 — SLINGS

(a) Scope.

This section applies to slings used in conjunction with other material handling equipment for the movement of material by hoisting, in employments covered by this part. (a)

Types of slings covered are those made from alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope (conventional three strand construction), and synthetic web (nylon, polyester and polypropylene.) (a)

(c) Safe Operating Practices.

Are the following practices observed whenever any sling is used?

(1) Slings that are damaged or defective shall not be used.

(2) Slings shall not be shortened with knots or bolts or other makeshift devices.

(3) Sling legs shall not be kinked.

(4) Slings shall not be loaded in excess of their rated capacities.

(5) Slings used in a basket hitch shall have the loads balanced to prevent slippage.

(6) Slings shall be securely attached to their loads.

(7) Slings shall be padded or protected from the sharp edges of their loads.

(8) Suspended loads shall be kept clear of all obstructions.

(9) All employees shall be kept clear of loads about to be lifted and of suspended loads.

(10) Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.

(11) Shock loading is prohibited.

(12) A sling shall not be pulled from under a load when the load is resting on the sling. (c)(1)-(12)

(d) Inspections.

Is the sling and all fastenings and attachments inspected each day before being used, for damage or defects, by a competent person designated by the employer? (d)

Are additional inspections performed during sling use, where service conditions warrant? (d)

Are damaged or defective slings immediately removed from service? (d)

(e) Alloy Steel Chain Slings.

Sling Identification.

Is durable identification stating size, grade, rated capacity, and reach permanently affixed to alloy steel chain slings? (e)(1)

Attachments.

Is the rated capacity of all attachments such as hooks, rings, coupling links, etc. at least equal to that of the alloy steel chain with which they are used? (e)(2)(i)

	YES	NO
If not, is the sling restricted to use that does not exceed the rated capacity of the weakest component? **(e)(2)(ii)**		
Are makeshift links or fasteners formed from bolts or rods, or other such attachments prohibited from use? **(e)(2)(ii)**		
Periodic Inspections. In addition to the daily use inspection required above, is a thorough periodic inspection of alloy steel chain slings in use made at least every 12 months or more frequently determined on the basis of: (a) frequency of sling use; (b) severity of service conditions; (c) nature of lifts being made; and (d) experience gained on the service life of slings used in similar circumstances. **(e)(3)(i)**		
Is a record maintained of the most recent month in which each alloy steel chain sling was thoroughly inspected, and is such recard available for examination? **(e)(3)(ii)**		
Is the thorough inspection performed by a competent person designated by the employer, and does it include a thorough inspection for wear, defective welds, deformation and increase in length? **(e)(3)(iii)**		
When such defects or deterioration is present, is the sling immediately removed from service? **(e)(3)(iii)**		
Proof Testing. Prior to use, is each now, repaired, or reconditioned alloy steel chain sling, including all welded components in the sling assembly, proof tested by the sling manufacturer or equivalent entity? **(e)(4)**		
Is such testing conducted in accordance with paragraph 5.2 of the American Society of Testing and Materials Specification A391-65 (ANSI G61.1-1968)? **(e)(4)**		
Is a certificate of proof test retained and available for examination? **(e)(4)**		
Sling Use. Are alloy steel chain slings limited for use with loads that are within the rated capacities prescribed in Table N-184-1 ?* **(e)(5)**		
Are slings not included in this table used only in accordance with the manufacturer's recommendations? **(e)(5)**		
Are alloy steel chain slings permanently removed for service if they are heated above 1000° F? **(e)(6)**		
When exposed to service temperatures in excess of 600° F, are maximum working load limits permitted in Table N-184-1* reduced in accordance with the chain or sling manufacturer's recommendations? **(e)(6)**		
Repairing and Reconditioning Alloy Steel Chain Slings. Are worn or damaged slings or attachments removed from use until repaired? **(e)(7)(i)**		
When welding or heat testing is performed, are slings not placed back in use unless repaired, reconditioned and proof tested by the sling manufacturer or an equivalent entity? **(e)(7)(i)**		

*See Self-Inspection Appendix.

	YES	NO
Are mechanical coupling links or low carbon steel repair links prohibited in effecting repair of broken lengths of chain? **(e)(7)(ii)**		
Effects of Wear. Is the sling removed from service if the chain size at any point of any links is less than that stated in Table N-184-2?* **(e)(8)**		
Deformed Attachments. Are slings with cracked or deformed master links, coupling links or other components removed from service?(**(e)(9)(i)**		
Are slings removed from service if the hooks are cracked, or have been opened more than 15% of the normal throat opening (measured at the narrowest point) or twisted more than 10 degrees from the plane of the unbent hook? **(e)(9)(ii)**		
(f) Wire Rope Slings. Are wire rope slings restricted to use with loads that do not exceed the rated capacities shown in Tables N-184-3 through N-184-14?* **(f)(1)**		
For those slings not included in these tables, are such slings used only in accordance with the manufacturer's recommendations? **(f)(1)**		
Minimum Sling Lengths. Do cable laid and 6 X 19 and 6 X 37 slings have a minimum clear length of wire rope 10 times the component rope diameter between splices, sleeves or end fittings? **(f)(2)(i)**		
Do braided slings have a minimum clear length of wire rope 40 times the component rope diameter between the loops or end fittings? **(f)(2)(ii)**		
Do cable laid grommets, strand laid grommets and endless slings have a minimum circumferential length of 96 times their body diameter? **(f)(2)(iii)**		
Safe Operating Temperatures. Are fiber core wire rope slings of all grades permanently removed from service if they are exposed to temperatures in excess of 200° F? **(f)(3)**		
When nonfiber core wire rope slings of any grade are used at temperatures above 400° F or below minus 60° F, are recommendations of the sling manufacturer regarding use at that temperature followed? **(f)(3)**		
End Attachments. Is welding of end attachments, except covering to thimbles, performed prior to the assembly of the sling? **(f)(4)(i)**		
Have all welded end attachments been proof tested, by the manufacturer or equivalent entity, at twice their rated capacity prior to initial use? **(f)(4)(ii)**		
Is a certificate of the proof test retained by the employer and available for examination? **(f)(4)(ii)**		
Removal from Service. Are wire rope slings immediately removed from service if any of the following conditions are present? (1) Ten randomly distributed broken wires in one rope lay, or five broken wires in one strand in one rope lay. **(f)(5)(i)**		

*See Self-Inspection Appendix.

YES | NO

(2) Wear or scraping of one-third the original diameter of outside individual wires. (f)(5)(ii)

(3) Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure. (f)(5)(iii)

(4) Evidence of heat damage. (f)(5)(iv)

(5) End attachments that are cracked, deformed or worn. (f)(5)(v)

(6) Hooks that have been opened more than 15% of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook. (f)(5)(vi)

(7) Corrosion of the rope or end attachments. (f)(5)(vii)

(g) Metal Mash Slings.

Sling Marking.

Does each metal mesh sling have permanently affixed to it a durable marking that states the rated capacity for vertical basket hitch and choker hitch loadings? (g)(1)

Handles.

Do handies have a rated capacity at least equal to the metal fabric and exhibit no deformation after proof testing? (g)(2)

Attachments of Handles to Fabric.

Are the fabric and handies so joined in accordance with the following?

(1) The rated capacity of the sling is not reduced. (g)(3)(i)

(2) The load is evenly distributed across the width of the fabric. (g)(3)(ii)

(3) Sharp edges will not damage the fabric. (g)(3)(iii)

Sling Coatings.

Are coatings which may diminish the rated capacity of a sling prohibited from use? (g)(4)

Sling Testing.

Prior to use, are all now and repaired metal mesh slings, including handles, proof tested by the manufacturer or equivalent entity at a minimum of 1½ times their rated capacity? (**Note:** Elastomer impregnated slings must be proof tested before coating.) (g)(5)

Proper Use of Metal Mash Slings.

Are metal mesh slings limited for use with loads that are within the rated capacities prescribed in Table N-184-15?* (g)(6)

Are slings not included in this table used only in accordance with the manufacturer's recommendations? (g)(6)

Safe Operating Temperatures.

Is the working load limit of metal mesh slings reduced in accordance with the sling manufacturer's recommendations for operations outside the following temperature ranges or for slings impregnated with other materials?

(1) Minus 20° F to plus 550° F for slings not impregnated with elastomers.

(2) Slings impregnated with polyvinyl chloride or neoprene may be used only in temperatures from 0° F to plus 200° F. (g)(7)

*See Self-Inspection Appendix.

YES | NO

Repairs.

Are repairs to metal mesh slings performed only by a metal mesh sling manufacturer or an equivalent entity? (g)(8)(i)

Are repaired slings permanently marked or tagged, or a written record maintained, to indicate the date and nature of the repairs and the person or organization that performed the repairs? (g)(8)(ii)

Are records of repairs available for examination? (g)(8)(ii)

Removal from Service.

Are metal mesh slings immediately removed from service if any of the following conditions are present?

(1) A broken weld or broken brazed joint along the sling edge. (g)(9)(i)

(2) Reduction in wire diameter of 25% due to abrasion or 15% due to corrosion. (g)(9)(ii)

(3) Lack of flexibility due to distortion of the fabric. (g)(9)(iii)

(4) Distortion of the female handle so that the depth of the slot is increased more than 10%. (g)(9)(iv)

(5) Distartion of either handle so that the width of the eye is decreased more than 10%. (g)(9)(v)

(6) A 15% reduction of the original cross sectional area of metal at any point around the handle eye. (g)(9)(vi)

(7) Distortion of either handle out of its plane. (g)(9)(vii)

(h) Natural and Synthetic Fiber Rope Slings.

Sling Use.

Are fiber rope slings (made from conventional 3-strand construction fiber rope) limited for use with loads that are within the rated capacities prescribed in Tables N-184-16 through N-184-19?* (h)(1)(i)

Do fiber rope slings have a diameter or curvature meeting at least the minimums specified in Figures N-184-4 and N-184-5?* (h)(1)(ii)

Are slings not included in these tables used only in accordance with the manufacturer's recommendation? (h)(1)(iii)

Safe Operating Temperatures.

Is the working load limit reduced in accordance with the sling manufacturer's recommendation for wet frozen slings or for operations outside of the following temperature range?

(1) Minus 20° F to plus 180° F for natural and synthetic fiber rope slings. (h)(2)

Splicing.

Have spliced fiber rope slings been spliced in accordance with the following minimum requirements and in accordance with any additional recommendations of the manufacturer?

(1) In manna rope, eye splices shall consist of at least three full tucks, and short splices shall consist of at least six full tucks, three on each side of the splice center line. (h)(3)(i)

(2) In synthetic fiber rope, eye splicesshall consist of at least four full tucks, and short splices shall consist of at least eight full tucks, four on each side ot the center line. (h)(3)(ii)

*See Self-Inspection Appendix.

YES NO

(3) Strand end tails shall not be trimmed flush with the surface of the rope immediately adjacent to the full tucks. This applies to all types of fiber rope and both eye and short splices. For fiber rope under one inch in diameter, the tail shall project at least six rope diameters beyond the last full tuck. For fiber rope one inch in diameter and larger, the tail shall project at least six inches beyond the last full tuck. Where a projecting tail interferes with the use of the sling, the tail shall be tapered and spliced into the body of the rope using at least two additional tucks (which will require a tail length of approximately six rope diameters beyond the last full tuck). **(h)(3)(iii)**

(4) Fiber rope slings shall have a minimum clear length of rope between eye splices equal to 10 times the rope diameter. **(h)(3)(iv)**

(5) Knots shall not be used in lieu of splices. **(h)(3)(v)**

(6) Clamps not designed specifically for fiber ropes shall not be used for splicing. **(h)(3)(vi)**

(7) For all eye splices, the eye shall be of such size to provide an included angle of not greater than 60 degrees at the splice when the eye is placed over the load or support. **(h)(3)(vii)**

End Attachments.

Are fiber rope slings removed from use when end attachments in contact with the rope have sharp edges or projections? **(h)(4)**

Removal from Service.

Are natural and synthetic fiber rope slings immediately removed from service if any of the following conditions are present?

(1) Abnormal wear. **(h)(5)(i)**

(2) Powdered fiber between strands. **(h)(5)(iii)**

(3) Broken or cut fibers. **(h)(5)(iii)**

(4) Variations in the size or roundness of strands. **(h)(5)(iv)**

(5) Discoloration or rotting. **(h)(5)(v)**

(6) Distortion of hardware in the sling. **(h)(5)(vi)**

Repairs.

Are repaired or reconditioned fiber rope slings prohibited from use? (**Note**: Only fiber rope slings made from new rope shall be used.) **(h)(6)**

(i) Synthetic Web Slings.

Sling Identification.

Is each sling marked or coded to show the rated capacities for each type of hitch and type of synthetic web material? **(i)(1)**

Webbing.

Is synthetic webbing of uniform thickness and width and are selvage edges not split from the webbing's width? **(i)(2)**

Fittings.

Are fittings of a minimum breaking strength equal to that of the sling and free of all sharp edges that could in any way damage the webbing? **(i)(3)**

YES NO

Attachment of End Fittings to Webbing and Formation of Eyes.

Is stitching the only method used to auach end fittings to webbing and to form eyes, and is the thread in an even pattern and contain sufficient number of stitches to develop the full breaking strength of the sling? **(i)(4)**

Sling use.

Are synthetic web slings illustrated in Figure N-184-6* limited for use with loads that are within the rated capacities prescribed in Tables N-184-20 through N-184-22?* **(i)(5)**

Are slings not included in these tables used only in accoridance with the manufacturer's recommendation? **(i)(5)**

Environmental Conditions.

Are the following precautions taken when synthetic web slings are used?

(1) Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present. **(i)(6)(i)**

(2) Polyester and polypropylene web slings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present. **(i)(6)(ii)**

(3) Web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present. **(i)(6)(iii)**

Safe Operating Temperatures.

Are synthetic web slings of polyester and nylon used only in temperatures that do not exceed 180° F? **(i)(7)**

Are polypropylene web slings restricted from use at temperatures in excess of 200° F? **(i)(7)**

Repairs.

Is the repair of synthetic web slings performed by a sling manufacturer or an equivalent entity? **(i)(8)(i)**

Is each repaired sling proof tested by the manufacturer or equivalent entity to twice the rated capacity prior to its return to service? **(i)(8)(ii)**

Does the employer retain a certificate of the proof test and is it available for examination? **(i)(8)(ii)**

Are temporary repairs to slings, including webbing and fittings prohibited? **(i)(8)(iii)**

Removal from Service.

Are synthetic web slings immediately removed from service if any of the following conditions are present?

(1) Acid or caustic burns. **(i)(9)(i)**

(2) Melting or charring of any part of the sling surface. **(i)(9)(ii)**

(3) Snags, punctures, tears or cuts. **(i)(9)(iii)**

(4) Broken or worn stitches. **(i)(9)(iv)**

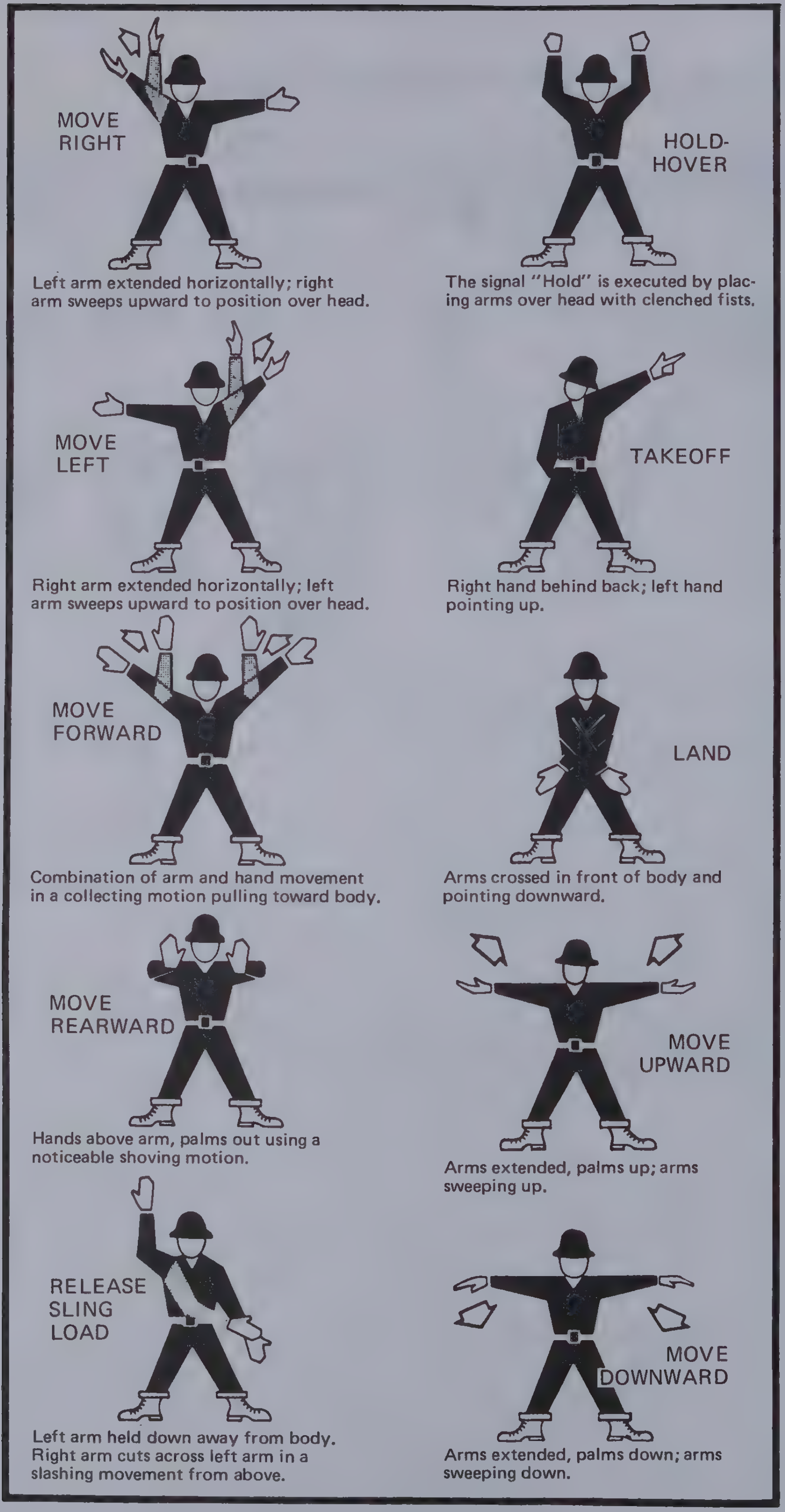
(5) Distortion of fittings. **(i)(9)(v)**

*See Self-Inspection Appendix.

TABLE N-1 – Summary Table on Use of Industrial Trucks in Various Locations

Classes	Unclassified	Class I locations								Class II locations						Class III locations	
Description of classes	Locations not possessing atmospheres as described in other columns.	Locations in which flammable gases or vapors are, or may be, present in the air in quantities sufficient to produce explosive or ignitible mixtures.								Locations which are hazardous because of the presence of combustible dust.						Locations where easily ignitible fibers or flyings are present but not likely to be in suspension in quantities sufficient to produce ignitible mixtures.	
Groups in classes	None	A	B	C	D					E	F	G				None	
Examples of locations or atmospheres in classes and groups	Piers and wharves inside and outside general storage, general industrial or commercial properties.	Acetylene	Hydrogen	Ethyl ether	Gasoline Naphtha Alcohols Acetone Lacquer solvent Benzene					Metal dust	Carbon black coal dust, coke dust.	Grain dust flour dust, starch dust, organic dust.				Baled waste, cocoa fiber, cotton, excelsior, hemp, istle, jute, kapok, oakum, sisal, Spanish moss, synthetic fibers, tow.	
		1				2				1			2			1	2
Divisions (nature of hazardous conditions)	None	Above condition exists continuously, intermittently, or periodically under normal operating conditions.				Above condition may occur accidentally as due to a puncture of a storage drum.				Explosive mixture may be present under normal operating conditions, or where failure of equipment may cause the condition to exist simultaneously with arcing or sparking of electrical equipment, or where dusts of an electrically conducting nature may be present.			Explosive mixture not normally present, but where deposits of dust may cause heat rise in electrical equipment, or where such deposits may be ignited by arcs or sparks from electrical equipment.			Locations in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.	Locations in which easily ignitible fibers are stored or handled (except in the process of manufacture).
Authorized uses of trucks by types in groups of classes and divisions																	
Groups in classes	None	A	B	C	D	A	B	C	D	E	F	G	E	F	G	None	None
Types of trucks authorized:																	
Diesel:																	
Type D	D**																
Type DS									DS						DS		DS
Type DY									DY						DY	DY	DY
Electric:																	
Type E	E**																E
Type ES									ES						ES		ES
Type EE									EE						EE	EE	EE
Type EX					EX				EX		EX	EX			EX	EX	EX
Gasoline:																	
Type G	G**																
Type GS									GS						GS		GS
LP-Gas:																	
Type LP	LP**																
Type LPS									LPS						LPS		LPS
Paragraph Ref. in No. 505	210.211	201 (a)			203 (a)	209 (a)			204 (a), (b)	202 (a)	205 (a)		209 (a)		206 (a), (b)	207 (a)	208 (a)

**Trucks conforming to these types may also be used—see subdivision (c)(2)(x) and (c)(2)(xii) of this section.



Left arm extended horizontally; right arm sweeps upward to position over head.

The signal "Hold" is executed by placing arms over head with clenched fists.

Right arm extended horizontally; left arm sweeps upward to position over head.

Right hand behind back; left hand pointing up.

Combination of arm and hand movement in a collecting motion pulling toward body.

Arms crossed in front of body and pointing downward.

Hands above arm, palms out using a noticeable shoving motion.

Arms extended, palms up; arms sweeping up.

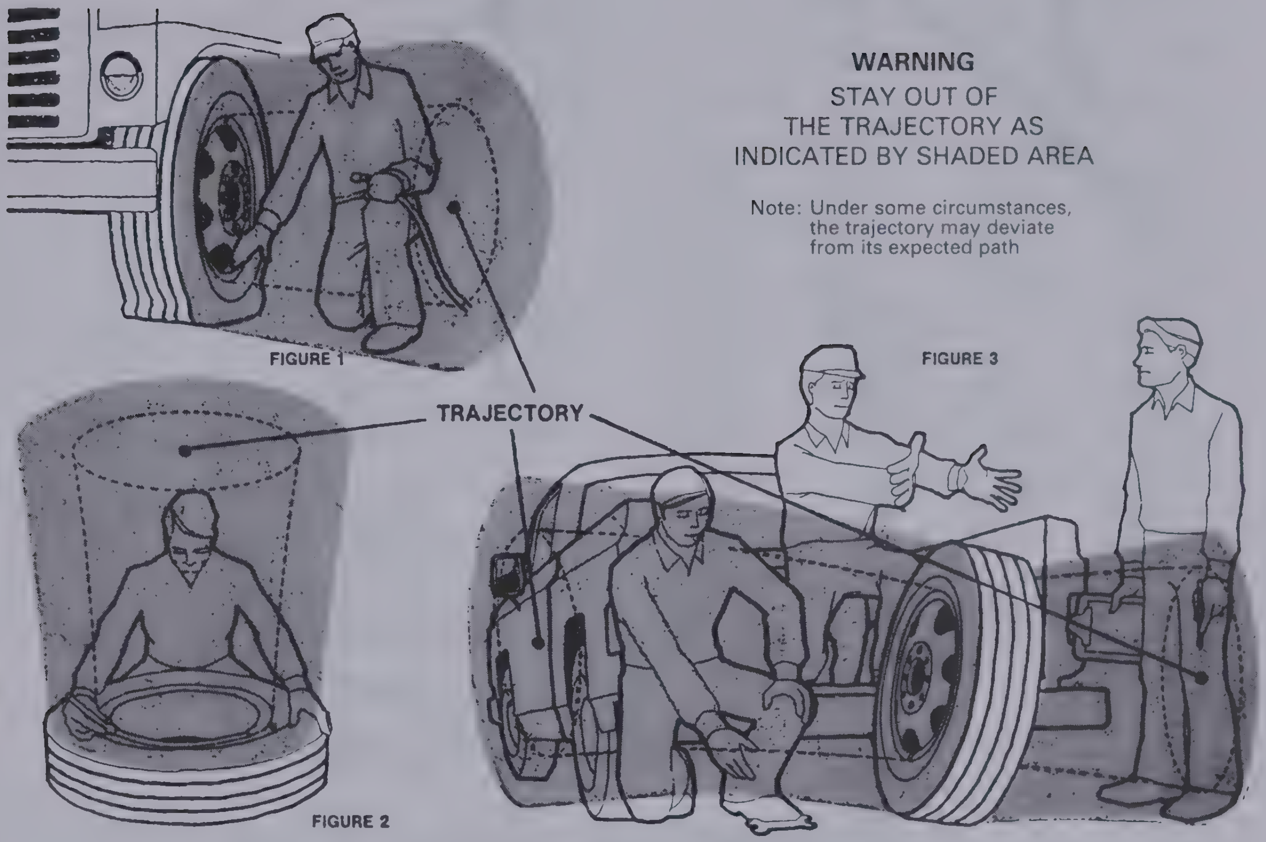
Left arm held down away from body. Right arm cuts across left arm in a slashing movement from above.

Arms extended, palms down; arms sweeping down.

FIGURE N-1 – Helicopter Hand Signal

T2

APPENDIX A
TRAJECTORY



WARNING
STAY OUT OF
THE TRAJECTORY AS
INDICATED BY SHADED AREA

Note: Under some circumstances, the trajectory may deviate from its expected path

Figure N-2

APPENDIX B
ORDERING INFORMATION FOR NHTSA CHARTS

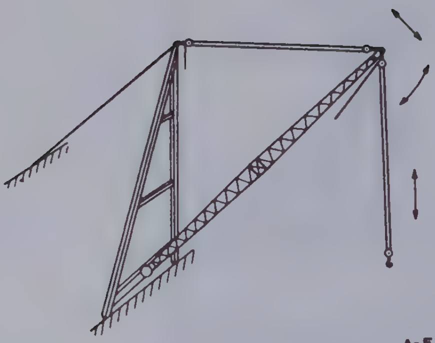
OSHA has printed two charts entitled "Demounting and Mounting Procedures for Truck/Bus Tires" and "Multi-piece Rim Matching Chart" as part of a continuing campaign to reduce accidents among employees who service large vehicle rim wheels.

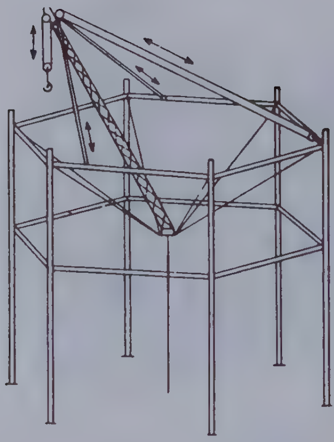
Reprints of the charts are available through the Occupational Safety and Health Administration (OSHA) Area and Regional Offices. The address and telephone number of the nearest OSHA Office can be obtained by looking in the local telephone directory under U.S. Government, U.S. Department of Labor, Occupational Safety and Health Administration.

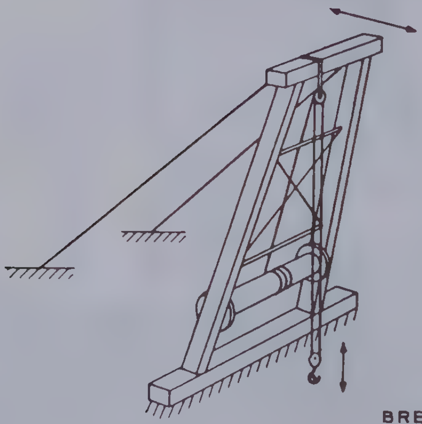
Single copies are available without charge.

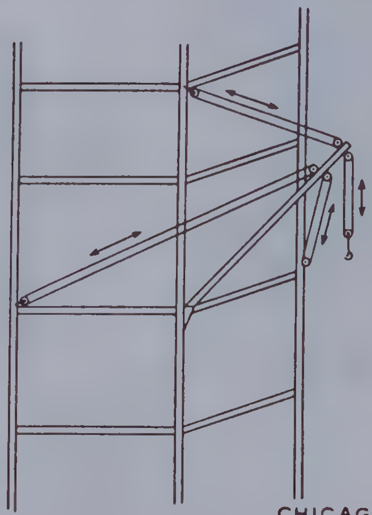
Individuals, establishments, and other organizations desiring multiple copies of these charts may order them from the OSHA Publications Office, U.S. Department of Labor, Room N-3101, Washington, DC 20210. Telephone: (202) 523-9667.

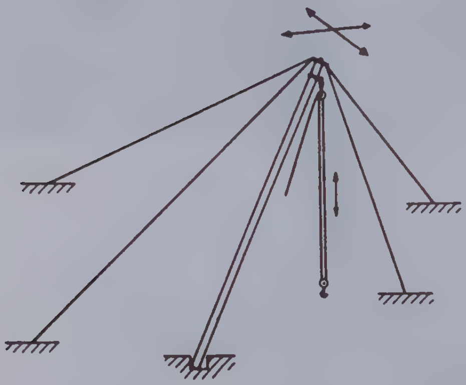
Derrick Illustrations

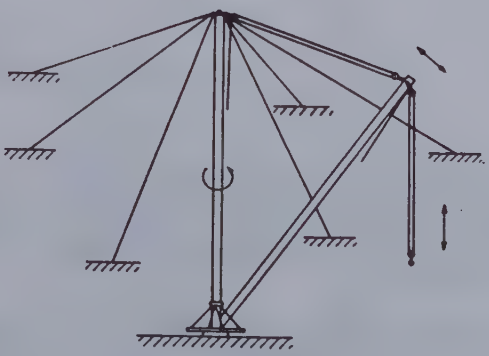

A-FRAME


BASKET


BREAST


CHICAGO BOOM


GIN POLE


GUY

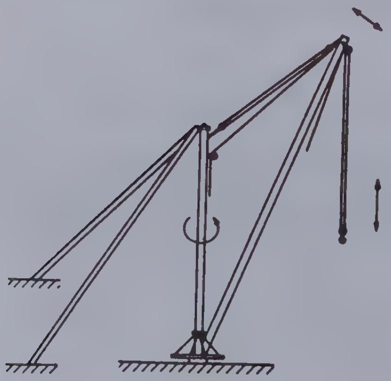

STIFF LEG

TABLE N-184-1 – Rated Capacity (Working Load Limit), for Alloy Steel Chain Sling; Rated Capacity (Working Load Limit), Pounds

Chain Size, Inches	Single Branch Sling - 90 degree Loading	Double Sling Vertical Angle (1)			Triple and Quadruple Sling (3) Vertical Angle (1)		
		30 degree	45 degree	60 degree	30 degree	45 degree	60 degree
		Horizontal Angle (2)			Horizontal Angle (2)		
		60 degree	45 degree	30 degree	60 degree	45 degree	30 degree
1/4	3,250	5,650	4,550	3,250	8,400	6,800	4,900
3/8	6,600	11,400	9,300	6,600	17,000	14,000	9,900
1/2	11,250	19,500	15,900	11,250	29,000	24,000	17,000
5/8	16,500	28,500	23,300	16,500	43,000	35,000	24,500
3/4	23,000	39,800	32,500	23,000	59,500	48,500	34,500
7/8	28,750	49,800	40,600	28,750	74,500	61,000	43,000
1	38,750	67,100	54,800	38,750	101,000	82,000	58,000
1-1/8	44,500	77,000	63,000	44,500	115,500	94,500	66,500
1-1/4	57,500	99,500	81,000	57,500	149,000	121,500	86,000
1-3/8	67,000	116,000	94,000	67,000	174,000	141,000	100,500
1-1/2	80,000	138,000	112,500	80,000	207,000	169,000	119,500
1-3/4	100,000	172,000	140,000	100,000	258,000	210,000	150,000

(1) Rating of multileg slings adjusted for angle of loading measured as the included angle between the inclined leg and the vertical as shown in Figure N–184–5.

(2) Rating of multileg slings adjusted for angle of loading between the inclined leg and the horizontal plane of the load, as shown in Figure N–184–5.

(3) Quadruple sling rating is same as triple sling because normal lifting practice may not distribute load uniformly to all 4 legs.

TABLE N-184-2 – Minimum Allowable Chain Size at Any Point of Link

Chain Size, Inches	Minimum Allowable Chain Size, Inches
1/4	13/64
3/8	19/64
1/2	25/64
5/8	31/64
3/4	19/32
7/8	45/64
1	13/16
1-1/8	29/32
1-1/4	1
1-3/8	1- 3/32
1-1/2	1- 3/16
1-3/4	1-13/32

TABLE N-184-3 – Rated Capacities for Single Leg Slings 6 x 19 and 6 x 37 Classification Improved Plow Steel Grade Rope with Fiber Core (FC)

Rope Dia (Inches)	Constr	Rated Capacities, Tons (2,000 lb)								
		Vertical			Choker			Vertical Basket*		
		HT	MS	S	HT	MS	S	HT	MS	S
1/4	6 x 19	0.49	0.51	0.55	0.37	0.38	0.41	0.99	1.0	1.1
5/16	6 x 19	0.76	0.79	0.85	0.57	0.59	0.64	1.5	1.6	1.7
3/8	6 x 19	1.1	1.1	1.2	0.80	0.85	0.91	2.1	2.2	2.4
7/16	6 x 19	1.4	1.5	1.6	1.1	1.1	1.2	2.9	3.0	3.3
1/2	6 x 19	1.8	2.0	2.1	1.4	1.5	1.6	3.7	3.9	4.3
9/16	6 x 19	2.3	2.5	2.7	1.7	1.9	2.0	4.6	5.0	5.4
5/8	6 x 19	2.8	3.1	3.3	2.1	2.3	2.5	5.6	6.2	6.7
3/4	6 x 19	3.9	4.4	4.8	2.9	3.3	3.6	7.8	8.8	9.5
7/8	6 x 19	5.1	5.9	6.4	3.9	4.5	4.8	10.0	12.0	13.0
1	6 x 19	6.7	7.7	8.4	5.0	5.8	6.3	13.0	15.0	17.0
1-1/8	6 x 19	8.4	9.5	10.0	6.3	7.1	7.9	17.0	19.0	21.0
1-1/4	6 x 37	9.8	11.0	12.0	7.4	8.3	9.2	20.0	22.0	25.0
1-3/8	6 x 37	12.0	13.0	15.0	8.9	10.0	11.0	24.0	27.0	30.0
1-1/2	6 x 37	14.0	16.0	17.0	10.0	12.0	13.0	28.0	32.0	35.0
1-5/8	6 x 37	16.0	18.0	21.0	12.0	14.0	15.0	33.0	37.0	41.0
1-3/4	6 x 37	19.0	21.0	24.0	14.0	16.0	18.0	38.0	43.0	48.0
2	6 x 37	25.0	28.0	31.0	18.0	21.0	23.0	49.0	55.0	62.0

HT = Hand Tucked Splice and Hidden Tuck Splice
For hidden tuck splice (IWRC) use values in HT columns.

MS = Mechanical Splice

S = Swaged or Zinc Poured Socket

* These values only apply when the D/d ratio for HT slings is 10 or greater, and for MS and S slings is 20 or greater where:

D = Diameter of curvature around which the body of the sling is bent.

d = Diameter of rope.

TABLE N-184-4 – Rated Capacities for Single Leg Slings 6 x 19 and 6 x 37 Classification Improved Plow Steel Grade Rope with Independent Wire Rope Core (IWRC)

Rope		Rated Capacities, Tons (2,000 lb)								
		Vertical			Choker			Vertical Basket		
Dia (Inches)	Constr	HT	MS	S	HT	MS	S	HT	MS	S
1/4	6 x 19	0.53	0.56	0.59	0.40	0.42	0.44	1.0	1.1	1.2
5/16	6 x 19	0.81	0.87	0.92	0.61	0.65	0.69	1.6	1.7	1.8
3/8	6 x 19	1.1	1.2	1.3	0.86	0.93	0.98	2.3	2.5	2.6
7/16	6 x 19	1.5	1.7	1.8	1.2	1.3	1.3	3.1	3.4	3.5
1/2	6 x 19	2.0	2.2	2.3	1.5	1.6	1.7	3.9	4.4	4.6
9/16	6 x 19	2.5	2.7	2.9	1.8	2.1	2.2	4.9	5.5	5.8
5/8	6 x 19	3.0	3.4	3.6	2.2	2.5	2.7	6.0	6.8	7.2
3/4	6 x 19	4.2	4.9	5.1	3.1	3.6	3.8	8.4	9.7	10.0
7/8	6 x 19	5.5	6.6	6.9	4.1	4.9	5.2	11.0	13.0	14.0
1	6 x 19	7.2	8.5	9.0	5.4	6.4	6.7	14.0	17.0	18.0
1-1/8	6 x 19	9.0	10.0	11.0	6.8	7.8	8.5	18.0	21.0	23.0
1-1/4	6 x 37	10.0	12.0	13.0	7.9	9.2	9.9	21.0	24.0	26.0
1-3/8	6 x 37	13.0	15.0	16.0	9.6	11.0	12.0	25.0	29.0	32.0
1-1/2	6 x 37	15.0	17.0	19.0	11.0	13.0	14.0	30.0	35.0	38.0
1-5/8	6 x 37	18.0	20.0	22.0	13.0	15.0	17.0	35.0	41.0	44.0
1-3/4	6 x 37	20.0	24.0	26.0	15.0	18.0	19.0	41.0	47.0	51.0
2	6 x 37	26.0	30.0	33.0	20.0	23.0	25.0	53.0	61.0	66.0

HT = Hand Tucked Splice
For hidden tuck splice (IWRC) use Table I values in HT column.

MS = Mechanical Splice.

S = Swaged or Zinc Poured Socket.

These values only apply when the D/d ratio for HT slings is 10 or greater, and for MS and S Slings is 20 or greater where:

D = Diameter of curvature around which the body of the sling is bent.

d = Diameter of rope.

TABLE N-184-5 – Rated Capacities for Single Leg Slings

Cable Laid Rope–Mechanical Splice Only
7 x 7 x 7 & 7 x 7 x 19 Constructions Galvanized Aircraft Grade Rope
7 x 6 x 19 IWRC Construction Improved Plow Steel Grade Rope

Rope		Rated Capacities, Tons (2,000 lb)		
Dia (Inches)	Constr	Vertical	Choker	Vertical Basket*
1/4	7 x 7 x 7	0.50	0.38	1.0
3/8	7 x 7 x 7	1.1	0.81	2.0
1/2	7 x 7 x 7	1.8	1.4	3.7
5/8	7 x 7 x 7	2.8	2.1	5.5
3/4	7 x 7 x 7	3.8	2.9	7.6
5/8	7 x 7 x 19	2.9	2.2	5.8
3/4	7 x 7 x 19	4.1	3.0	8.1
7/8	7 x 7 x 19	5.4	4.0	11.0
1	7 x 7 x 19	6.9	5.1	14.0
1-1/8	7 x 7 x 19	8.2	6.2	16.0
1-1/4	7 x 7 x 19	9.9	7.4	20.0
3/4	7 x 6 x 19 IWRC	3.8	2.8	7.6
7/8	7 x 6 x 19 IWRC	5.0	3.8	10.0
1	7 x 6 x 19 IWRC	6.4	4.8	13.0
1-1/8	7 x 6 x 19 IWRC	7.7	5.8	15.0
1-1/4	7 x 6 x 19 IWRC	9.2	6.9	18.0
1-5/16	7 x 6 x 19 IWRC	10.0	7.5	20.0
1-3/8	7 x 6 x 19 IWRC	11.0	8.2	22.0
1-1/2	7 x 6 x 19 IWRC	13.0	9.6	26.0

* These values only apply when the D/d ratio is 10 or greater where:

D = Diameter of curvature around which the body of the sling is bent.

d = Diameter of rope.

TABLE N-184-6 – Rated Capacities for Single Leg Slings
8-Part and 6-Part Braided Rope
6 x 7 and 6 x 19 Construction Improved Plow Steel Grade Rope
7 x 7 Construction Galvanized Aircraft Grade Rope

Component Ropes		Rated Capacities, Tons (2,000 lb)					
Diameter		Vertical		Choker		Basket, Vertical to 30 degree	
(Inches)	Constr	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part
3/32	6 x 7	0.42	0.32	0.32	0.24	0.74	0.55
1/8	6 x 7	0.76	0.57	0.57	0.42	1.3	0.98
3/16	6 x 7	1.7	1.3	1.3	0.94	2.9	2.2
3/32	7 x 7	0.51	0.39	0.38	0.29	0.89	0.67
1/8	7 x 7	0.95	0.71	0.71	0.53	1.6	1.2
3/16	7 x 7	2.1	1.5	1.5	1.2	3.6	2.7
3/16	6 x 19	1.7	1.3	1.3	0.98	3.0	2.2
1/4	6 x 19	3.1	2.3	2.3	1.7	5.3	4.0
5/16	6 x 19	4.8	3.6	3.6	2.7	8.3	6.2
3/8	6 x 19	6.8	5.1	5.1	3.8	12.0	8.9
7/16	6 x 19	9.3	6.9	6.9	5.2	16.0	12.0
1/2	6 x 19	12.0	9.0	9.0	6.7	21.0	15.0
9/16	6 x 19	15.0	11.0	11.0	8.5	26.0	20.0
5/6	6 x 19	19.0	14.0	14.0	10.0	32.0	24.0
3/4	6 x 19	27.0	20.0	20.0	15.0	46.0	35.0
7/8	6 x 19	36.0	27.0	27.0	20.0	62.0	47.0
1	6 x 19	47.0	35.0	35.0	26.0	81.0	61.0

These values only apply when the D/d ratio is 20 or greater where:

D = Diameter of curvature around which the body of the sling is bent.

d = Diameter of component rope.

TABLE N-184-7 – Rated Capacities for 2-Leg & 3-Leg Bridle Slings 6 x 19 and 6 x 37 Classification Improved Plow Steel Grade Rope with Fiber Core (FC)

Rope		Rated Capacities, Tons (2,000 lb)											
		2-Leg Bridle Slings						3-Leg Bridle Slings					
Dia (Inches)	Constr.	Vert 30 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree		Vert 30 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree	
		HT	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT	MS
1/4	6 x 19	0.85	0.88	0.70	0.72	0.49	0.51	1.3	1.3	1.0	1.1	0.74	0.76
5/16	6 x 19	1.3	1.4	1.1	1.1	0.76	0.79	2.0	2.0	1.6	1.7	1.1	1.2
3/8	6 x 19	1.8	1.9	1.5	1.6	1.1	1.1	2.8	2.9	2.3	2.4	1.6	1.7
7/16	6 x 19	2.5	2.6	2.0	2.2	1.4	1.5	3.7	4.0	3.0	3.2	2.1	2.3
1/2	6 x 19	3.2	3.4	2.6	2.8	1.8	2.0	4.8	5.1	3.9	4.2	2.8	3.0
9/16	6 x 19	4.0	4.3	3.2	3.5	2.3	2.5	6.0	6.5	4.9	5.3	3.4	3.7
5/8	6 x 19	4.8	5.3	4.0	4.4	2.8	3.1	7.3	8.0	5.9	6.5	4.2	4.6
3/4	6 x 19	6.8	7.6	5.5	6.2	3.9	4.4	10.0	11.0	8.3	9.3	5.8	6.6
7/8	6 x 19	8.9	10.0	7.3	8.4	5.1	5.9	13.0	15.0	11.0	13.0	7.7	8.9
1	6 x 19	11.0	13.0	9.4	11.0	6.7	7.7	17.0	20.0	14.0	16	10.0	11.0
1-1/8	6 x 19	14.0	16.0	12.0	13.0	8.4	9.5	22.0	24.0	18.0	20.0	13.0	14.0
1-1/4	6 x 37	17.0	19.0	14.0	16.0	9.8	11.0	25.0	29.0	21.0	23.0	15.0	17.0
1-3/8	6 x 37	20.0	23.0	17.0	19.0	12.0	13.0	31.0	35.0	25.0	28.0	18.0	20.0
1-1/2	6 x 37	24.0	27.0	20.0	22.0	14.0	16.0	36.0	41.0	30.0	33.0	21.0	24.0
1-5/8	6 x 37	28.0	32.0	23.0	26.0	16.0	18.0	43.0	48.0	35.0	39.0	25.0	28.0
1-3/4	6 x 37	33.0	37.0	27.0	30.0	19.0	21	49.0	56.0	40.0	45.0	28.0	32.0
2	6 x 37	43.0	48.0	35.0	39.0	25.0	28.0	64.0	72.0	52.0	59.0	37.0	41.0

HT = Hand Tucked Splice.

MS = Mechanical Splice

TABLE N-184-8 – Rated Capacities for 2-Leg & 3-Leg Bridle Slings 6 x 19 and 6 x 37 Classification Improved Plow Steel Grade Rope with Independent Wire Rope Core (IWRC)

Rope		Rated Capacities, Tons (2,000 lb)											
		2-Leg Bridle Sling						3-Leg Bridle Sling					
Dia (Inches)	Constr.	Vert 30 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree		Vert 30 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree	
		HT	MS	HT	MS	HT	MS	HT	MS	HT	MS	HT	MS
1/4	6 x 19	0.92	0.97	0.75	0.79	0.53	0.56	1.4	1.4	1.1	1.2	0.79	0.84
5/16	6 x 19	1.4	1.5	1.1	1.2	0.81	0.87	2.1	2.3	1.7	1.8	1.2	1.3
3/8	6 x 19	2.0	2.1	1.6	1.8	1.1	1.2	3.0	3.2	2.4	2.6	1.7	1.9
7/16	6 x 19	2.7	2.9	2.2	2.4	1.5	1.7	4.0	4.4	3.3	3.6	2.3	2.5
1/2	6 x 19	3.4	3.8	2.8	3.1	2.0	2.2	5.1	5.7	4.2	4.6	3.0	3.3
9/16	6 x 19	4.3	4.8	3.5	3.9	2.5	2.7	6.4	7.1	5.2	5.8	3.7	4.1
5/8	6 x 19	5.2	5.9	4.2	4.8	3.0	3.4	7.8	8.8	6.4	7.2	4.5	5.1
3/4	6 x 19	7.3	8.4	5.9	6.9	4.2	4.9	11.0	13.0	8.9	10.0	6.3	7.3
7/8	6 x 19	9.6	11.0	7.8	9.3	5.5	6.6	14.0	17.0	12.0	14.0	8.3	9.9
1	6 x 19	12.0	15.0	10.0	12.0	7.2	8.5	19.0	22.0	15.0	18.0	11.0	13.0
1-1/8	6 x 19	16.0	18.0	13.0	15.0	9.0	10.0	23.0	27.0	19.0	22.0	13.0	16.0
1-1/4	6 x 37	18.0	21.0	15.0	17.0	10.0	12.0	27.0	32.0	22.0	26.0	16.0	18.0
1-3/8	6 x 37	22.0	25.0	18.0	21.0	13.0	15.0	33.0	38.0	27.0	31.0	19.0	22.0
1-1/2	6 x 37	26.0	30.0	21.0	25.0	15.0	17.0	39.0	45.0	32.0	37.0	23.0	26.0
1-5/8	6 x 37	31.0	35.0	25.0	29.0	18.0	20.0	46.0	53.0	38.0	43.0	27.0	31.0
1-3/4	6 x 37	35.0	41.0	29.0	33.0	20.0	24.0	53.0	61.0	43.0	50.0	31.0	35.0
2	6 x 37	46.0	53.0	37.0	43.0	26.0	30.0	68.0	79.0	56.0	65.0	40.0	46.0

HT = Hand Tucked Splice

MS= Mechanical Splice

TABLE N-184-9 – Rated Capacities for 2-Leg & 3-Leg Bridle Slings
Cable Laid Rope–Mechanical Splice Only
7 x 7 x 7 and 7 x 7 x 19 Constructions Galvanized Aircraft Grade Rope
7 x 6 x 19 IWRC Construction Improved Plow Steel Grade Rope

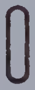
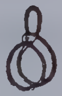
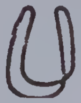
Rope		Rated Capacities, Tons (2,000 lb)					
		2-Leg Bridle Sling			3-Leg Bridle Sling		
Dia (Inches)	Constr	Vert 30 deg Horz 60 deg	45 degree Angle	Vert 60 deg Horz 30 deg	Vert 30 deg Horz 60 deg	45 degree Angle	Vert 60 deg Horz 30 deg
1/4	7 x 7 x 7	0.87	0.71	0.50	1.3	1.1	0.75
3/8	7 x 7 x 7	1.9	1.5	1.1	2.8	2.3	1.6
1/2	7 x 7 x 7	3.2	2.6	1.8	4.8	3.9	2.8
5/8	7 x 7 x 7	4.8	3.9	2.8	7.2	5.9	4.2
3/4	7 x 7 x 7	6.6	5.4	3.8	9.9	8.1	5.7
5/8	7 x 7 x 19	5.0	4.1	2.9	7.5	6.1	4.3
3/4	7 x 7 x 19	7.0	5.7	4.1	10.0	8.6	6.1
7/8	7 x 7 x 19	9.3	7.6	5.4	14.0	11.0	8.1
1	7 x 7 x 19	12.0	9.7	6.9	18.0	14.0	10.0
1-1/8	7 x 7 x 19	14.0	12.0	8.2	21.0	17.0	12.0
1-1/4	7 x 7 x 19	17.0	14.0	9.9	26.0	21.0	15.0
3/4	7x6x19 IWRC	6.6	5.4	3.8	9.9	8.0	5.7
7/8	7x6x19 IWRC	8.7	7.1	5.0	13.0	11.0	7.5
1	7x6x19 IWRC	11.0	9.0	6.4	17.0	13.0	9.6
1-1/8	7x6x19 IWRC	13.0	11.0	7.7	20.0	16.0	11.0
1-1/4	7x6x19 IWRC	16,0	13.0	9.2	24.0	20.0	14.0
1-5/16	7x6x19 IWRC	17.0	14.0	10.0	26.0	21.0	15.0
1-3/8	7x6x19 IWRC	19.0	15.0	11.0	28.0	23.0	16.0
1-1/2	7x6x19 IWRC	22.0	18.0	13.0	33.0	27.0	19.0

T2

TABLE N-184-10 – Rated Capacities For 2-Leg and 3-Leg Bridle Slings
8-Part and 6-Part Braided Rope
6 x 7 and 6 x 19 Construction Improved Plow Steel Grade Rope
7 x 7 Construction Galvanized Aircraft Grade Rope

Component Rope		Rated Capacities, Tons (2,000 lb)											
		2-Leg Bridle Slings						3-Leg Bridle Slings					
Dia (Inches)	Contr.	Vert 30 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree		Vert 30 degree Horz 60 degree		45 degree Angle		Vert 60 degree Horz 30 degree	
		8-Part	6-Part	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part	8-Part	6-Part
3/32	6 x 7	0.74	0.55	0.60	0.45	0.42	0.32	1.1	0.83	0.90	0.68	0.64	0.48
1/8	6 x 7	1.3	0.98	1.1	0.80	0.76	0.57	2.0	1.5	1.6	1.2	1.1	0.85
3/16	6 x 7	2.9	2.2	2.4	1.8	1.7	1.3	4.4	3.3	3.6	2.7	2.5	1.9
3/32	7 x 7	0.89	0.67	0.72	0.55	0.51	0.39	1.3	1.0	1.1	0.82	0.77	0.58
1/8	7 x 7	1.6	1.2	1.3	1.0	0.95	0.71	2.5	1.8	2.0	1.5	1.4	1.1
3/16	7 x 7	3.6	2.7	2.9	2.2	2.1	1.5	5.4	4.0	4.4	3.3	3.1	2.3
3/16	6 x 19	3.0	2.2	2.4	1.8	1.7	1.3	4.5	3.4	3.7	2.8	2.6	1.9
1/4	6 x 19	5.3	4.0	4.3	3.2	3.1	2.3	8.0	6.0	6.5	4.9	4.6	3.4
5/16	6 x 19	8.3	6.2	6.7	5.0	4.8	3.6	12.0	9.3	10.0	7.6	7.1	5.4
3/8	6 x 19	12.0	8.9	9.7	7.2	6.8	5.1	18.0	13.0	14.0	11.0	10.0	7.7
7/16	6 x 19	16.0	12.0	13.0	9.8	9.3	6.9	24.0	18.0	20.0	15.0	14.0	10.0
1/2	6 x 19	21.0	15.0	17.0	13.0	12.0	9.0	31.0	23.0	25.0	19.0	18.0	13.0
9/16	6 x 19	26.0	20.0	21.0	16.0	15.0	11.0	39.0	29.0	32.0	24.0	23.0	17.0
5/8	6 x 19	32.0	24.0	26	20.0	19.0	14.0	48.0	36.0	40.0	30.0	28.0	21.0
3/4	6 x 19	46.0	35.0	38.0	28.0	27.0	20.0	69.0	52.0	56.0	42.0	40.0	30.0
7/8	6 x 19	62.0	47.0	51.0	38.0	36.0	27.0	94.0	70.0	76.0	57.0	54.0	40.0
1	6 x 19	81.0	61.0	66.0	50.0	47.0	35.0	122.0	91.0	99.0	74.0	70.0	53.0

TABLE N-184-11 – Rated Capacities For Strand Laid Grommet-Hand Tucked Improved Plow Steel Grade Rope

ROPE BODY		RATED CAPACITIES, TONS (2,000 lb)		
Dia (Inches)	Constr	 Vertical	 Choker	 Vertical Basket*
1/4	7 × 19	0.85	0.64	1.7
5/16	7 × 19	1.3	1.0	2.6
3/8	7 × 19	1.9	1.4	3.8
7/16	7 × 19	2.6	1.9	5.2
1/2	7 × 19	3.3	2.5	6.7
9/16	7 × 19	4.2	3.1	8.4
5/8	7 × 19	5.2	3.9	10.0
3/4	7 × 19	7.4	5.6	15.0
7/8	7 × 19	10.0	7.5	20.0
1	7 × 19	13.0	9.7	26.0
1-1/8	7 × 19	16.0	12.0	32.0
1-1/4	7 × 37	18.0	14.0	37.0
1-3/8	7 × 37	22.0	16.0	44.0
1-1/2	7 × 37	26.0	19.0	52.0

* These values only apply when the D/d ratio is 5 or greater where:

D = Diameter of curvature around which rope is bent.

d = Diameter of rope body.

TABLE N-184-12 – Rated Capacities For Cable Laid Grommet-Hand Tucked 7 x 6 x 7 and 7 x 6 x 19 Constructions Improved Plow Steel Grade Rope 7 x 7 x 7 Construction Galvanized Aircraft Grade Rope

CABLE BODY		RATED CAPACITIES, TONS (2,000 lb)		
Dia (Inches)	Constr	Vertical	Choker	Vertical Basket*
3/8	7 × 6 × 7	1.3	0.95	2.5
9/16	7 × 6 × 7	2.8	2.1	5.6
5/8	7 × 6 × 7	3.8	2.8	7.6
3/8	7 × 7 × 7	1.6	1.2	3.2
9/16	7 × 7 × 7	3.5	2.6	6.9
5/8	7 × 7 × 7	4.5	3.4	9.0
5/8	7 × 6 × 19	3.9	3.0	7.9
3/4	7 × 6 × 19	5.1	3.8	10.0
15/16	7 × 6 × 19	7.9	5.9	16.0
1-1/8	7 × 6 × 19	11.0	8.4	22.0
1-5/16	7 × 6 × 19	15.0	11.0	30.0
1-1/2	7 × 6 × 19	19.0	14.0	39.0
1-11/16	7 × 6 × 19	24.0	18.0	49.0
1-7/8	7 × 6 × 19	30.0	22.0	60.0
2-1/4	7 × 6 × 19	42.0	31.0	84.0
2-5/8	7 × 6 × 19	56.0	42.0	112.0

* These values only apply when the D/d ratio is 5 or greater where:

D = Diameter of curvature around which cable body is bent.

d = Diameter of cable body.

TABLE N-184-13 – Rated Capacities For Strand Laid Endless Slings-Mechanical Joint Improved Plow Steel Grade Rope

ROPE BODY		RATED CAPACITIES, TONS (2,000 lb)		
Dia (Inches)	Constr	Vertical	Choker	Vertical Basket*
1/4	6 × 19 IWRC	0.92	0.69	1.8
3/8	6 × 19 IWRC	2.0	1.5	4.1
1/2	6 × 19 IWRC	3.6	2.7	7.2
5/8	6 × 19 IWRC	5.6	4.2	11.0
3/4	6 × 19 IWRC	8.0	6.0	16.0
7/8	6 × 19 IWRC	11.0	8.1	21.0
1	6 × 19 IWRC	14.0	10.0	28.0
1-1/8	6 × 19 IWRC	18.0	13.0	35.0
1-1/4	6 × 37 IWRC	21.0	15.0	41.0
1-3/8	6 × 37 IWRC	25.0	19.0	50.0
1-1/2	6 × 37 IWRC	29.0	22.0	59.0

* These values only apply when the D/d ratio is 5 or greater where:

D = Diameter of curvature around which rope is bent.

d = Diameter of rope body.

TABLE N-184-14 – Rated Capacities For Cable Laid Endless Slings-Mechanical Joint
7 x 7 x 7 and 7 x 7 x 19 Constructions Galvanized Aircraft Grade Rope
7 x 6 x 19 IWRC Construction Improved Plow Steel Grade Rope

CABLE BODY		RATED CAPACITIES, TONS (2,000 lb)		
Dia (Inches)	Constr	Vertical	Choker	Vertical Basket*
1/4	7 × 7 × 7	0.83	0.62	1.6
3/8	7 × 7 × 7	1.8	1.3	3.5
1/2	7 × 7 × 7	3.0	2.3	6.1
5/8	7 × 7 × 7	4.5	3.4	9.1
3/4	7 × 7 × 7	6.3	4.7	12.0
5/8	7 × 7 × 19	4.7	3.5	9.5
3/4	7 × 7 × 19	6.7	5.0	13.0
7/8	7 × 7 × 19	8.9	6.6	18.0
1	7 × 7 × 19	11.0	8.5	22.0
1-1/8	7 × 7 × 19	14.0	10.0	28.0
1-1/4	7 × 7 × 19	17.0	12.0	33.0
3/4	7 × 6 × 19 IWRC	6.2	4.7	12.0
7/8	7 × 6 × 19 IWRC	8.3	6.2	16.0
1	7 × 6 × 19 IWRC	10.0	7.9	21.0
1-1/8	7 × 6 × 19 IWRC	13.0	9.7	26.0
1-1/4	7 × 6 × 19 IWRC	16.0	12.0	31.0
1-3/8	7 × 6 × 19 IWRC	18.0	14.0	37.0
1-1/2	7 × 6 × 19 IWRC	22.0	16.0	43.0

* These values only apply when D/d value is 5 or greater where:

D = Diameter of curvature around which cable body is bent.

d = Diameter of cable body.

TABLE N-184-15 – Rated Capacities Carbon Steel & Stainless Steel Metal Mesh Slings

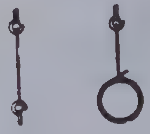
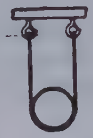
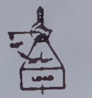
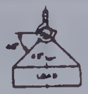
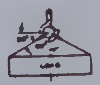
Sling Width In Inches	 Vertical or Choker	 Vertical Basket	Effect of Angle on Rated Capacities In Basket Hitch		
			 30 deg Vertical 60 deg Horizontal	 45 deg Vertical 45 deg Horizontal	 60 deg Vertical 30 deg Horizontal
Heavy Duty-10 Ga 35 Spirals/Ft of sling width					
2	1,500	3,000	2,600	2,100	1,500
3	2,700	5,400	4,700	3,800	2,700
4	4,000	8,000	6,900	5,600	4,000
6	6,000	12,000	10,400	8,400	6,000
8	8,000	16,000	13,800	11,300	8,000
10	10,000	20,000	17,000	14,100	10,000
12	12,000	24,000	20,700	16,900	12,000
14	14,000	28,000	24,200	19,700	14,000
16	16,000	32,000	27,700	22,600	16,000
18	18,000	36,000	31,100	25,400	18,000
20	20,000	40,000	34,600	28,200	20,000
Medium Duty-12 Ga 43 Spirals/Ft of sling width					
2	1,350	2,700	2,300	1,900	1,400
3	2,000	4,000	3,500	2,800	2,000
4	2,700	5,400	4,700	3,800	2,700
6	4,500	9,000	7,800	6,400	4,500
8	6,000	12,000	10,400	8,500	6,000
10	7,500	15,000	13,000	10,600	7,500
12	9,000	18,000	15,600	12,700	9,000
14	10,500	21,000	18,200	14,800	10,500
16	12,000	24,000	20,800	17,000	12,000
18	13,500	27,000	23,400	19,100	13,500
20	15,000	30,000	26,000	21,200	15,000
Light Duty-14 Ga 59 Spirals/Ft of sling width					
2	900	1,800	1,600	1,300	900
3	1,400	2,800	2,400	2,000	1,400
4	2,000	4,000	3,500	2,800	2,000
6	3,000	6,000	5,200	4,200	3,000
8	4,000	8,000	6,900	5,700	4,000
10	5,000	10,000	8,600	7,100	5,000
12	6,000	12,000	10,400	8,500	6,000
14	7,000	14,000	12,100	9,900	7,000
16	8,000	16,000	13,900	11,300	8,000
18	9,000	18,000	15,600	12,700	9,000
20	10,000	20,000	17,300	14,100	10,000

TABLE N-184-16 — Manila Rope Slings

Rope Dia. Nominal in Inches	Nominal Weight Per 100 ft. in Pounds	Eye & Eye Sling						Endless Sling					
		Vertical Hitch	Choker Hitch	Basket Hitch				Vertical Hitch	Choker Hitch	Basket Hitch			
				Angle of Rope to Horizontal						Angle of Rope to Horizontal			
				90	60°	45	30°			90°	60°	45°	30°
				Angle of Rope to Vertical						Angle of Rope to Vertical			
				0	30°	45°	60°			0°	30°	45°	60°
1/2	7.5	480	240	960	830	680	480	865	430	1,730	1,500	1,220	865
9/16	10.4	620	310	1,240	1,070	875	620	1,120	560	2,230	1,930	1,580	1,120
5/8	13.3	790	395	1,580	1,370	1,120	790	1,420	710	2,840	2,460	2,010	1,420
3/4	16.7	970	485	1,940	1,680	1,370	970	1,750	875	3,490	3,020	2,470	1,750
13/16	19.5	1,170	585	2,340	2,030	1,650	1,170	2,110	1,050	4,210	3,650	2,980	2,110
7/8	22.5	1,390	695	2,780	2,410	1,970	1,390	2,500	1,250	5,000	4,330	3,540	2,500
1"	27.0	1,620	810	3,240	2,810	2,290	1,620	2,920	1,460	5,830	5,050	4,120	2,920
1 1/16	31.3	1,890	945	3,780	3,270	2,670	1,890	3,400	1,700	6,800	5,890	4,810	3,400
1 1/8	36.0	2,160	1,080	4,320	3,740	3,050	2,160	3,890	1,940	7,780	6,730	5,500	3,890
1 1/4	41.7	2,430	1,220	4,860	4,210	3,440	2,430	4,370	2,190	8,750	7,580	6,190	4,370
1 5/16	47.9	2,700	1,350	5,400	4,680	3,820	2,700	4,860	2,430	9,720	8,420	6,870	4,860
1 1/2	59.9	3,330	1,670	6,660	5,770	4,710	3,330	5,990	3,000	12,000	10,400	8,480	5,990
1 5/8	74.6	4,050	2,030	8,100	7,010	5,730	4,050	7,290	3,650	14,600	12,600	10,300	7,290
1 3/4	89.3	4,770	2,390	9,540	8,260	6,740	4,770	8,590	4,290	17,200	14,900	12,100	8,590
2"	107.5	5,580	2,790	11,200	9,660	7,890	5,580	10,000	5,020	20,100	17,400	14,200	10,000
2 1/8	125.0	6,480	3,240	13,000	11,200	9,160	6,480	11,700	5,830	23,300	20,200	16,500	11,700
2 1/4	146.0	7,380	3,690	14,800	12,800	10,400	7,380	13,300	6,640	26,600	23,000	18,800	13,300
2 1/2	166.7	8,370	4,190	16,700	14,500	11,800	8,370	15,100	7,530	30,100	26,100	21,300	15,100
2 5/8	190.8	9,360	4,680	18,700	16,200	13,200	9,360	16,800	8,420	33,700	29,200	23,800	16,800

See Figs. N-184-4 & N-184-5 for sling configuration descriptions.

TABLE N-184-17 – Nylon Rope Slings

Rope Dia. Nom-inal in Inches	Nominal Weight Per 100 Ft. in Pounds	Eye & Eye Sling						Endless Sling					
		Vertical Hitch	Choker Hitch	Basket Hitch				Vertical Hitch	Choker Hitch	Basket Hitch			
				Angle of Rope to Horizontal						Angle of Rope to Horizontal			
				90°	60°	45°	30°			90°	60°	45°	30°
				Angle of Rope to Vertical						Angle of Rope to Vertical			
				0°	30	45°	60°			0°	30°	45	60°
1/2	6.5	635	320	1,270	1,100	900	635	1,140	570	2,290	1,980	1,620	1,140
9/16	8.3	790	395	1,580	1,370	1,120	790	1,420	710	2,840	2,460	2,010	1,420
5/8	10.5	1,030	515	2,060	1,780	1,460	1,030	1,850	925	3,710	3,210	2,620	1,850
3/4	14.5	1,410	705	2,820	2,440	1,990	1,410	2,540	1,270	5,080	4,400	3,590	2,540
13/16	17.0	1,680	840	3,360	2,910	2,380	1,680	3,020	1,510	6,050	5,240	4,280	3,020
7/8	20.0	1,980	990	3,960	3,430	2,800	1,980	3,560	1,780	7,130	6,170	5,040	3,560
1"	26.0	2,480	1,240	4,960	4,300	3,510	2,480	4,460	2,230	8,930	7,730	6,310	4,460
1 1/16	29.0	2,850	1,430	5,700	4,940	4,030	2,850	5,130	2,570	10,300	8,890	7,260	5,130
1 1/8	34.0	3,270	1,640	6,540	5,660	4,620	3,270	5,890	2,940	11,800	10,200	8,330	5,890
1 1/4	40.0	3,710	1,860	7,420	6,430	5,250	3,710	6,680	3,340	13,400	11,600	9,450	6,680
1 5/16	45.0	4,260	2,130	8,520	7,380	6,020	4,260	7,670	3,830	15,300	13,300	10,800	7,670
1 1/2	55.0	5,250	2,630	10,500	9,090	7,420	5,250	9,450	4,730	18,900	16,400	13,400	9,450
1 5/8	68.0	6,440	3,220	12,900	11,200	9,110	6,440	11,600	5,800	23,200	20,100	16,400	11,600
1 3/4	83.0	7,720	3,860	15,400	13,400	10,900	7,720	13,900	6,950	27,800	24,100	19,700	13,900
2"	95.0	9,110	4,560	18,200	15,800	12,900	9,110	16,400	8,200	32,800	28,400	23,200	16,400
2 1/8	109.0	10,500	5,250	21,000	18,200	14,800	10,500	18,900	9,450	37,800	32,700	26,700	18,900
2 1/4	129.0	12,400	6,200	24,800	21,500	17,500	12,400	22,300	11,200	44,600	38,700	31,600	22,300
2 1/2	149.0	13,900	6,950	27,800	24,100	19,700	13,900	25,000	12,500	50,000	43,300	35,400	25,000
2 5/8	168.0	16,000	8,000	32,000	27,700	22,600	16,000	28,800	14,400	57,600	49,900	40,700	28,800

See Figs. N-184-4 & N-184-5 for sling configuration descriptions.

TABLE N-184-18 — Polyester Rope Slings

Rope Dia. Nominal In Inches	Nominal Weight Per 100 Ft. In Pounds	Eye & Eye Sling						Endless Sling					
		Vertical Hitch	Choker Hitch	Basket Hitch				Vertical Hitch	Choker Hitch	Basket Hitch			
				Angle of Rope to Horizontal						Angle of Rope to Horizontal			
				90	60°	45	30°			90	60°	45°	30°
				Angle of Rope to Vertical						Angle of Rope to Vertical			
				0°	30°	45°	60°			0°	30°	45°	60°
1/2	8.0	635	320	1,270	1,100	900	635	1,140	570	2,290	1,980	1,620	1,140
9/16	10.2	790	395	1,580	1,370	1,120	790	1,420	710	2,840	2,460	2,010	1,420
5/8	13.0	990	495	1,980	1,710	1,400	990	1,780	890	3,570	3,090	2,520	1,780
3/4	17.5	1,240	620	2,480	2,150	1,750	1,240	2,230	1,120	4,470	3,870	3,160	2,230
13/16	21.0	1,540	770	3,080	2,670	2,180	1,540	2,770	1,390	5,540	4,800	3,920	2,770
7/8	25.0	1,780	890	3,560	3,080	2,520	1,780	3,200	1,600	6,410	5,550	4,530	3,200
1"	30.5	2,180	1,090	4,360	3,780	3,080	2,180	3,920	1,960	7,850	6,800	5,550	3,920
1 1/16	34.5	2,530	1,270	5,060	4,380	3,580	2,530	4,550	2,280	9,110	7,990	6,440	4,550
1 1/8	40.0	2,920	1,460	5,840	5,060	4,130	2,920	5,260	2,630	10,500	9,100	7,440	5,260
1 1/4	46.3	3,290	1,650	6,580	5,700	4,650	3,290	5,920	2,960	11,800	10,300	8,380	5,920
1 5/16	52.5	3,710	1,860	7,420	6,430	5,250	3,710	6,680	3,340	13,400	11,600	9,450	6,680
1 1/2	66.8	4,630	2,320	9,260	8,020	6,550	4,630	8,330	4,170	16,700	14,400	11,800	8,330
1 5/8	82.0	5,640	2,820	11,300	9,770	7,980	5,640	10,200	5,080	20,300	17,600	14,400	10,200
1 3/4	98.0	6,710	3,360	13,400	11,600	9,490	6,710	12,100	6,040	24,200	20,900	17,100	12,100
2"	118.0	7,920	3,960	15,800	13,700	11,200	7,920	14,300	7,130	28,500	24,700	20,200	14,300
2 1/8	135.0	9,110	4,460	18,200	15,800	12,900	9,110	16,400	8,200	32,800	28,400	23,200	16,400
2 1/4	157.0	10,600	5,300	21,200	18,400	15,000	10,600	19,100	9,540	38,200	33,100	27,000	19,100
2 1/2	181.0	12,100	6,050	24,200	21,000	17,100	12,100	21,800	10,900	43,600	37,700	30,800	21,800
2 5/8	205.0	13,600	6,800	27,200	23,600	19,200	13,600	24,500	12,200	49,000	42,400	34,600	24,500

TABLE N-184-19 – Polyprepylene Rope Slings

Rope Dia. Nom-inal In Inches	Nom-inal Weight Per 100 Ft. In Pounds	Eye & Eye Sling						Endless Sling					
		Vertical Hitch	Choker Hitch	Basket Hitch				Vertical Hitch	Choker Hitch	Basket Hitch			
				Angle of Rope to Horizontal						Angle of Rope to Horizontal			
				90°	60°	45°	30°			90°	60°	45°	30°
				Angle of Rope to Vertical						Angle of Rope to Vertical			
				0°	30°	45°	60°			0°	30°	45°	60°
1/2	4.7	645	325	1,290	1,120	910	645	1,160	580	2,320	2,010	1,640	1,160
9/16	6.1	780	390	1,560	1,350	1,100	780	1,400	700	2,810	2,430	1,990	1,400
5/8	7.5	950	475	1,900	1,650	1,340	950	1,710	855	3,420	2,960	2,420	1,710
3/4	10.7	1,300	650	2,600	2,250	1,840	1,300	2,340	1,170	4,680	4,050	3,310	2,340
13/16	12.7	1,520	760	3,040	2,630	2,150	1,520	2,740	1,370	5,470	4,740	3,870	2,740
7/8	15.0	1,760	880	3,520	3,050	2,490	1,760	3,170	1,580	6,340	5,490	4,480	3,170
1"	18.0	2,140	1,070	4,280	3,700	3,030	2,140	3,850	1,930	7,700	6,670	5,450	3,860
1 1/16	20.4	2,450	1,230	4,900	4,240	3,460	2,450	4,410	2,210	8,820	7,640	6,240	4,410
1 1/8	23.7	2,800	1,400	5,600	4,850	3,960	2,800	5,040	2,520	10,100	8,730	7,130	5,040
1 1/4	27.0	3,210	1,610	6,420	5,560	4,540	3,210	5,780	2,890	11,600	10,000	8,170	5,780
1 5/16	30.5	3,600	1,800	7,200	6,240	5,090	3,600	6,480	3,240	13,000	11,200	9,170	6,480
1 1/2	38.5	4,540	2,270	9,080	7,860	6,420	4,540	8,170	4,090	16,300	14,200	11,600	8,170
1 5/8	47.5	5,510	2,760	11,000	9,540	7,790	5,510	9,920	4,960	19,800	17,200	14,000	9,920
1 3/4	57.0	6,580	3,290	13,200	11,400	9,300	6,580	11,800	5,920	23,700	20,500	16,800	11,800
2"	69.0	7,960	3,980	15,900	13,800	11,300	7,960	14,300	7,160	28,700	24,800	20,300	14,300
2 1/8	80.0	9,330	4,670	18,700	16,200	13,200	9,330	16,800	8,400	33,600	29,100	23,800	16,800
2 1/4	92.0	10,600	5,300	21,200	18,400	15,000	10,600	19,100	9,540	38,200	33,100	27,000	19,100
2 1/2	107.0	12,200	6,100	24,400	21,100	17,300	12,200	22,000	11,000	43,900	38,000	31,100	22,000
2 5/8	120.0	13,800	6,900	27,600	23,900	19,600	13,800	24,800	12,400	49,700	43,000	35,100	24,800

See Figs. N-184-4 & 184-5 for sling configuration descriptions.

TABLE N-184-20 — Rated Capacity in Pounds
Synthetic Web Slings
1,000 Lbs Per Inch of Width
Single Ply

Sling Body Width, Inches	Triangle—Choker Slings, Type I Triangle—Triangle Slings, Type II Eye & Eye with Flat Eye Slings, Type III Eye & Eye with Twisted Eye Slings, Type IV						Endless Slings, Type V						Return Eye Slings, Type VI					
	Vert.	Choker	Vert. Basket	30° Basket	45° Basket	60° Basket	Vert.	Choker	Vert. Basket	30° Basket	45° Basket	60° Basket	Vert.	Choker	Vert. Basket	30° Basket	45° Basket	60° Basket
1	1,000	750	2,000	1,700	1,400	1,000	1,600	1,300	3,200	2,800	2,300	1,600	800	650	1,600	1,400	1,150	800
2	2,000	1,500	4,000	3,500	2,800	2,000	3,200	2,600	6,400	5,500	4,500	3,200	1,600	1,300	3,200	2,800	2,300	1,600
3	3,000	2,200	6,000	5,200	4,200	3,000	4,800	3,800	9,600	8,300	6,800	4,800	2,400	1,950	4,800	4,150	3,400	2,400
4	4,000	3,000	8,000	6,900	5,700	4,000	6,400	5,100	12,800	11,100	9,000	6,400	3,200	2,600	6,400	5,500	4,500	3,200
5	5,000	3,700	10,000	8,700	7,100	5,000	8,000	6,400	16,000	13,900	11,300	8,000	4,000	3,250	8,000	6,900	5,650	4,000
6	6,000	4,500	12,000	10,400	8,500	6,000	9,600	7,700	19,200	16,600	13,600	9,600	4,800	3,800	9,600	8,300	6,800	4,800

Notes: 1. All angles shown are measured from the verticle.
2. Capacities for intermediate widths not shown may be obtained by interpolation.

TABLE N-184-21 — Rated Capacity in Pounds
Synthetic Web Slings
1,200 Lbs Per Inch of Width
Single Ply

Sling Body Width, Inches	Triangle—Choker Slings, Type I Triangle—Triangle Slings, Type II Eye & Eye with Flat Eye Slings, Type III Eye & Eye with Twisted Eye Slings, Type IV						Endless Slings, Type V						Return Eye Slings, Type VI					
	Vert	Choker	Vert. Basket	30 Basket	45 Basket	60 Basket	Vert.	Choker	Vert. Basket	30 Basket	45 Basket	60 Basket	Vert.	Choker	Vert. Basket	30 Basket	45 Basket	60 Basket
1	1,200	900	2,400	2,100	81,700	91,200	1,900	1,500	3,800	3,300	2,700	1,900	950	750	1,900	1,650	1,350	950
2	2,400	1,800	4,800	4,200	83,400	92,400	3,800	3,000	7,600	6,600	5,400	3,800	1,900	1,500	3,800	3,300	2,700	1,900
3	3,600	2,700	7,200	6,200	85,100	93,600	5,800	4,600	11,600	10,000	8,200	5,800	2,850	2,250	5,700	4,950	4,050	2,850
4	4,800	3,600	9,600	8,300	86,800	94,800	7,700	6,200	15,400	13,300	10,900	7,700	3,800	3,000	7,600	6,600	5,400	3,800
5	6,000	4,500	12,000	10,400	88,500	96,000	9,600	7,700	19,200	16,600	13,600	9,600	4,750	3,750	9,500	8,250	6,750	4,750
6	7,200	5,400	14,400	12,500	810,200	97,200	11,500	9,200	23,000	19,900	16,300	11,500	5,800	4,600	11,600	10,000	8,200	5,800

Notes: 1. All angles shown are measured from the verticle.
2. Capacities for intermediate widths not shown may be obtained by interpolation.

TABLE N-184-22 – Rated Capacity in Pounds
Synthetic Web Slings
1,600 Lbs Per Inch of Width
Single Ply

Sling Body Width, Inches	Triangle—Choker Slings, Type I Triangle—Triangle Slings, Type II Eye & Eye with Flat Eye Slings, Type III Eye & Eye with Twisted Eye Slings, Type IV						Endless Slings, Type V						Return Eye Slings, Type VI					
	Vert.	Choker	Vert. Basket	30° Basket	45° Basket	60° Basket	Vert.	Choker	Vert. Basket	30° Basket	45° Basket	60° Basket	Vert.	Choker	Vert. Basket	30° Basket	45° Basket	60° Basket
1	1,600	1,200	3,200	2,800	**82,300**	**91,600**	2,600	2,100	5,200	4,500	3,700	2,600	1,050	1,050	2,600	2,250	1,850	1,300
2	3,200	2,400	6,400	5,500	**84,500**	**93,200**	5,100	4,100	10,200	8,800	7,200	5,100	2,600	2,100	5,200	4,500	3,700	2,600
3	4,800	3,600	9,600	8,300	**86,800**	**94,800**	7,700	6,200	15,400	13,300	10,900	7,700	3,900	3,150	7,800	6,750	5,500	3,900
4	6,400	4,800	12,800	11,100	**89,000**	**96,400**	10,100	8,200	20,400	17,700	14,400	10,200	5,100	4,100	10,200	8,800	7,200	5,100
5	8,000	6,000	16,000	13,800	**811,300**	**98,000**	12,800	10,200	25,600	22,200	18,100	12,800	6,400	5,150	12,800	11,050	9,050	6,400
6	9,600	7,200	19,200	16,600	**813,600**	**99,600**	15,400	12,300	30,800	26,700	21,800	15,400	7,700	6,200	15,400	13,300	10,900	7,700

Notes: 1. All angles shown are measured from the verticle.
2. Capacities for intermediate widths not shown may be obtained by interpolation.

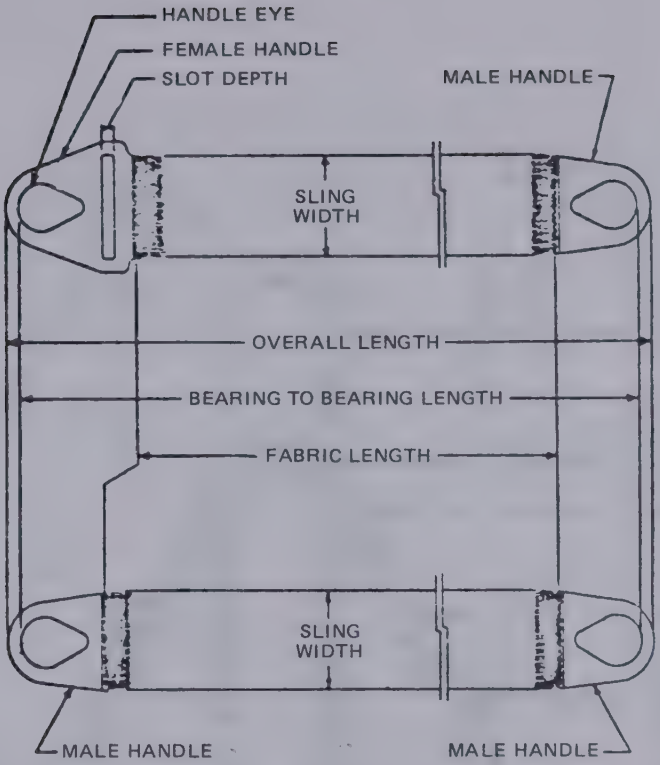


FIGURE N-184-1 – Metal Mesh Sling (Typical)

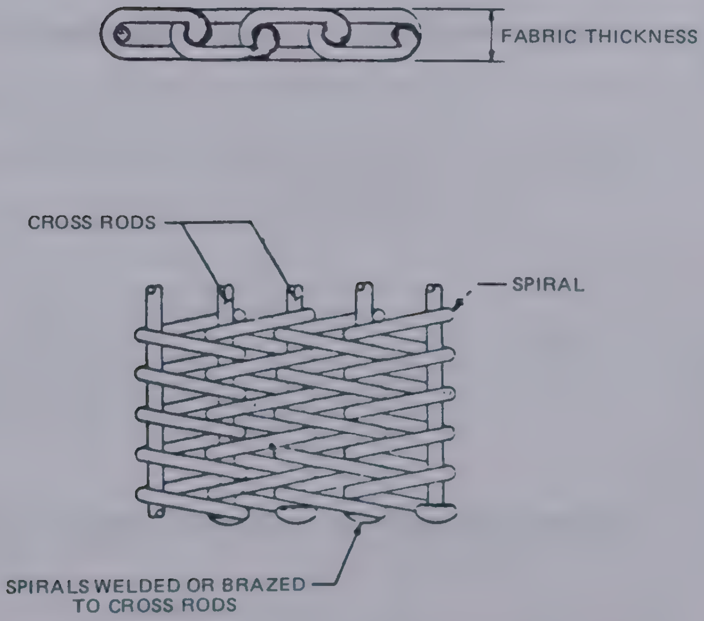


FIGURE N-184-2 – Metal Mesh Construction

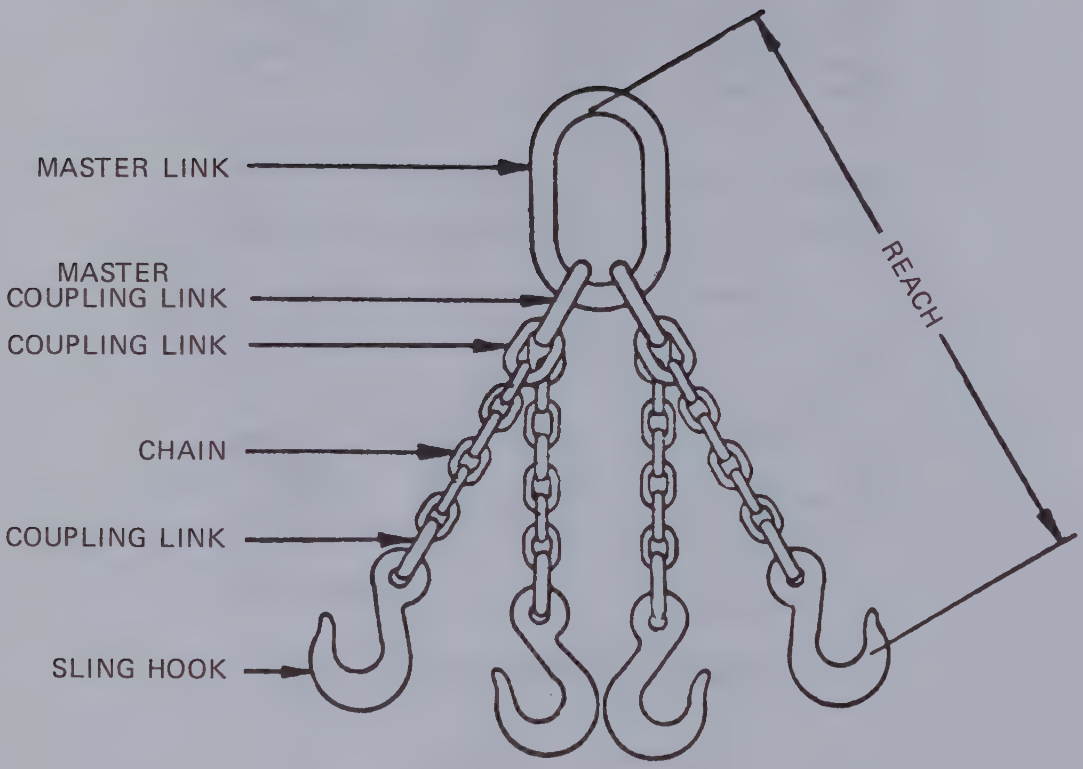
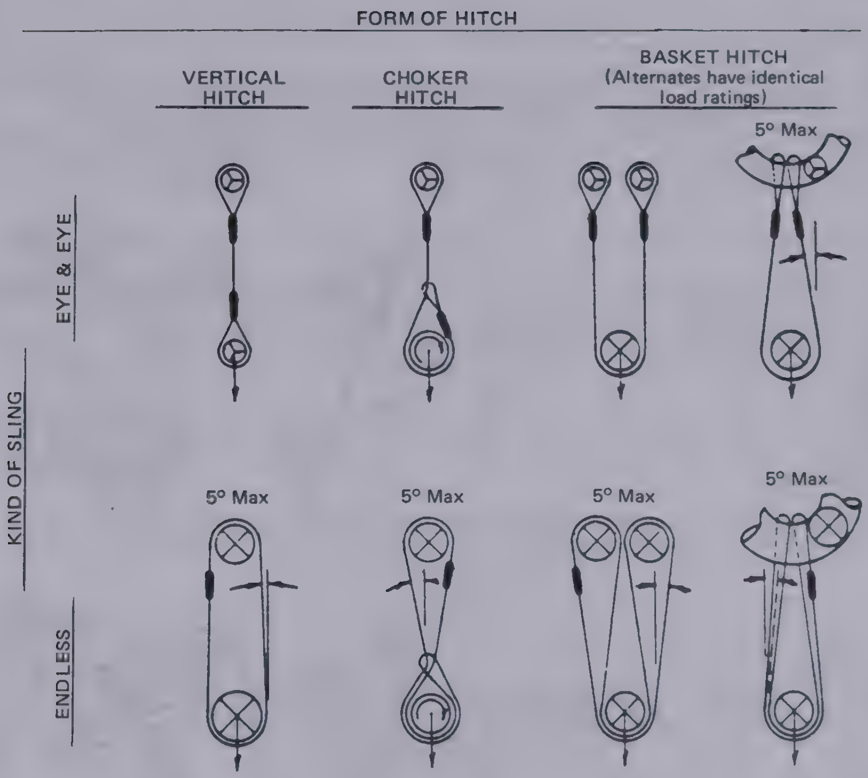


FIGURE N-184-3 – Major Components of a Quadruple Sling



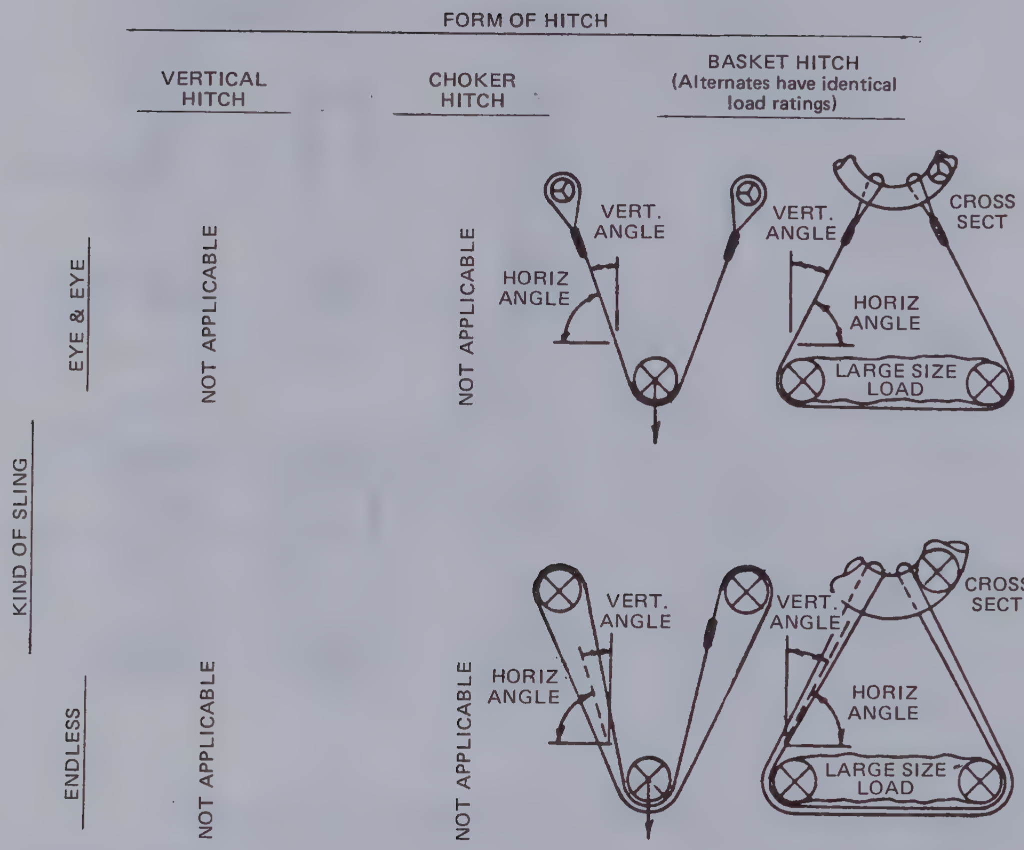
NOTES: Angle 5° or less from the vertical may be considered vertical angles.

For slings with legs more than 5° off vertical, the actual angle as shown in Figure N-184-5 must be considered.

EXPLANATION OF SYMBOLS: MINIMUM DIAMETER OF CURVATURE

⊛	Represents a contact surface which shall have a diameter or curvature at least double the diameter of the rope from which the sling is made.
⊗	Represents a contact surface which shall have a diameter of curvature at least 8 times the diameter of the rope.
↻	Represents a load in a choker hitch and illustrates the rotary force on the load and/or the slippage of the rope in contact with the load. Diameter of curvature of load surface shall be at least double the diameter of the rope.

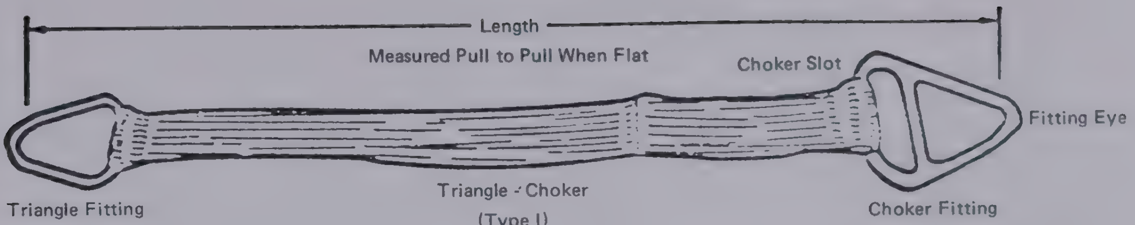
FIGURE N-184-4 – Basic Sling Configurations with Vertical Legs



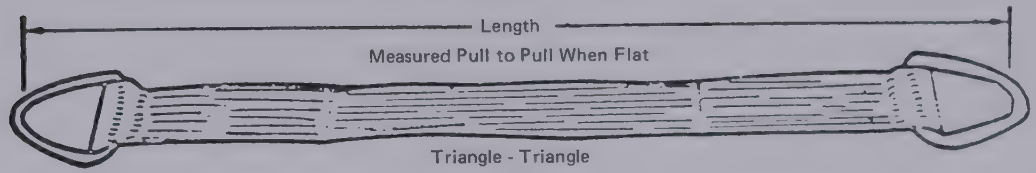
NOTES: For vertical angles of 5° or less, refer to Figure N-184-4 "Basic Sling Configurations with Vertical Legs".

See Figure N-184-4 for explanation of symbols.

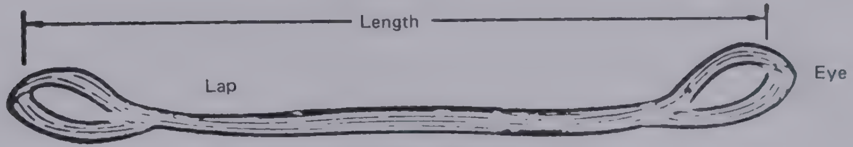
FIGURE N-184-5 – Sling Configurations with Angled Legs



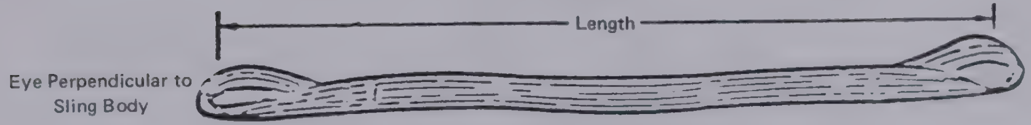
Triangle - Choker
(Type I)



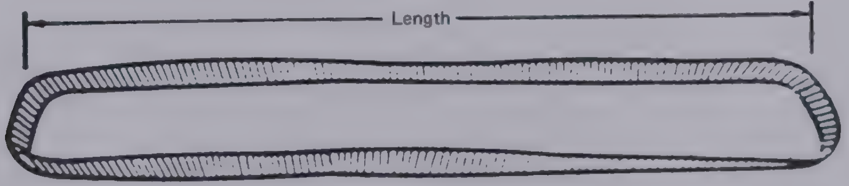
Triangle - Triangle
(Type II)



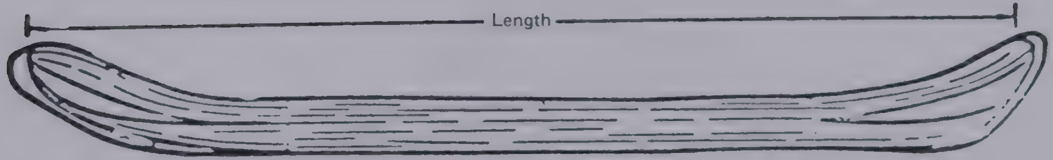
Eye and Eye With Flat Eyes
(Type III)



Eye and Eye With Twisted Eyes
(Type IV)



Endless Type
(Type V)



Return Eye
(Type VI)

FIGURE N-184-6 – Basic Synthetic Web Sling Constructions

T2

OVERVIEW: SUBPART O

MACHINERY AND MACHINE GUARDING

This subpart is designed to prevent injury to machine operators and employees in machine areas by requiring guarding devices and methods.

The general requirements, 1910.212, apply to all machines. Guards are required whenever a machine poses hazards at its point of operation, nip points, rotating parts, or with flying chips or sparks.

Woodworking machinery requirements, 1910.213, include specifications for the design, machine controls, and machine guards for woodworking machines, including saws, jointers, lathes, etc.

Abrasive wheel machinery, 1910.215, requires safety guards to be used with all abrasive wheels except those being used for internal work, mounted wheels two inches or less in diameter, and types 16, 17, 18, 18R, and 19 cones, plugs, and threaded hole pot balls where protection is provided by the work itself. Natural sandstone abrasive wheels, and metal, wooden, cloth, or paper discs with abrasive surfaces are not covered by this section. The section contains requirements for cup wheels, exposure angles, guard design, mounting, repairs, and maintenance.

Mills and calendars in the rubber and plastics industries, 1910.216, contains requirements for safety controls, trip and emergency switches, and stopping limits.

Mechanical power presses, 1910.217, applies to all power presses except: press brakes; hydraulic and pneumatic power presses; bulldozers; hot bending and hot metal presses; forging presses and hammers; and riveting and other fastening machines. The section contains requirements for machine design, brakes, treadles, controls, disconnect switches, point of operation guards, hand feeding tools, inspection, repair, maintenance, and employee training and injury reporting.

Forging machines, 1910.218, applies to the use of lead in the forge shop or die shop (lead casts, for example). The section outlines requirements for personal protective equipment, safe operations, and machine inspections and maintenance.

Mechanical power transmission apparatus, 1910.219, covers power transmission belts, except those that are small in size or operating at slow speeds (see exceptions on page 0-20). The section contains safety requirements for, among others, pulleys, shafting, belts and ropes, gears, couplings, and clutches. Design requirements for safety guards are also specified.

Specific sections of the standard covered in the checklist:

Std. No. **Page No.**
1910.212 **General requirements for all machines** 0-01
1910.213 **Woodworking machinery requirements** 0-01
1910.215 **Abrasive wheel machinery** 0-06
1910.216 **Mills and calendars in the rubber and plastics industries** 0-09
1910.217 **Mechanical power presses** 0-11
1910.218 **Forging machines** 0-16
1910.219 **Mechanical power transmission apparatus** 0-20

N11

DEFINITIONS — SUBPART O

Definitions applicable to 1910.213, Woodworking machinery requirements:

Block. A short block of wood, provided with a handle similar to that of a plane and a shoulder at the rear end, which is used for pushing short stock over revolving cutters.

Point of operation. That point at which cutting, shaping, boring, or forming is done.

Push stick. A narrow strip of wood or other soft material with a notch cut into one end and which is used to push short pieces of material through saws.

Definitions applicable to 1910.215, Abrasive wheel machinery:

Abrasive wheel. A cutting tool consisting of abrasive grains held together by organic or inorganic bonds. Diamond and reinforced wheels are included.

Cutting off wheels. Wheels having a diameter thickness and hole size dimensions and subject to all limitations of mounting and use listed for type 1 wheels. They may be steel centered, diamond abrasive or organic bonded abrasive of the plain or reinforced type.

(i) **Limitation:** Cutting off wheels are recommended only for use on specially designed and fully guarded machines and are subject to the following maximum thickness and hole size limitations.

Wheel diameter:	Max. thickness (inch)
6 inch and smaller	3/16
Larger than 6 inches to 12 inches	1/4
Larger than 12 inches to 23 inches	3/8
Larger than 23 inches	1/2

(ii) Maximum hole size for cutting-off wheels should not be larger than 1/4-wheel diameter.

Flanges. Collars, discs or plates between which wheels are mounted and are referred to as adaptor, sleeve, or back up type.

Inorganic wheels. Wheels which are bonded by means of inorganic material such as clay, glass, porcelain, sodium silicate, magnesium oxychloride, or metal.

Modified types 6 and 11 wheels (terrazzo). Type 6 and 11 cup wheels used in the terrazzo trade having tapered K dimensions to match a special tapered flange furnished by the machine builder.

Limitation: These wheels shall be mounted only with a special tapered flange.

Off-hand grinding. The grinding of any material or part which is held in the operator's hand.

Organic wheels. Wheels which are bonded by means of an organic material such as resin, rubber, shellac, or other similar bonding agent.

Safety guard. An enclosure designed to restrain the pieces of the grinding wheel and furnish all possible protection in the event that the wheel is broken in operation.

Snagging. Grinding which removes relatively large amounts of material without regard to close tolerances or surface finish requirements.

Surface feet per minute (s.f.p.m.). The distance in feet any one abrasive grain on the peripheral surface of a grinding wheel travels in 1 minute.

$$\text{Surface Feet Per Minute} = \frac{3.1416 \times \text{diameter in inches} \times \text{r.p.m.}}{12}$$

or

$$.262 \times \text{diameter in inches} \times \text{r.p.m.}$$

Type 1 straight wheels. Wheels having diameter, thickness, and hole size dimensions, which should be used only on the periphery. Type 1 wheels must be mounted between flanges.

Limitation: Hole dimension (H) should not be greater than two-thirds of wheel diameter dimension (D) for precision, cylindrical, centerless, or surface grinding applications. Maximum hole size for all other applications should not exceed one-half wheel diameter.

Type 2 cylinder wheels. Wheels having diameter, wheel thickness, and rim thickness dimensions. Grinding is performed on the rim face only, dimension W. Cylinder wheels may be plain, plate mounted, inserted nut, or of the projecting stud type.

Limitation: Rim height, T dimension, is generally equal to or greater than rim thickness, W dimension.

Type 6 straight cup wheel. Wheels having diameter, thickness, hole size, rim thickness, and back thickness dimensions. Grinding is always performed on rim face, W dimension.

Limitation: Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition, when unthreaded hole wheels are specified, the inside flat, K dimension, must be large enough to accommodate a suitable flange.

Type 11 flaring cup wheels. Wheels having double diameter dimensions D and J and having thickness, hole size, rim and back thickness dimensions. Grinding is always performed on rim face, W dimension. Type 11 wheels are subject to all limitations of use and mounting listed for type 6 straight sided cup wheels definition.

Limitation: Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition, when unthreaded hole wheels are specified, the inside flat, K dimension, shall be large enough to accommodate a suitable flange.

Type 27A depressed center, cutting-off wheels. Wheels having diameter, thickness, and hole size dimensions. They are reinforced, organic bonded, offset hub type wheels, usually 16 inches diameter or larger, specially designed for use on cutting-off machines where mounting nut or outer flange interference cannot be tolerated.

Types 27 and 28 depressed center wheels. Wheels having diameter, thickness, and hole size dimensions. Both types are reinforced organic bonded wheels having offset hubs which permit side and peripheral grinding operations without interference with the mounting. Type 27 wheels are manufactured with flat grinding rims permitting notching and cutting operations. Type 28 wheels have saucer shaped grinding rims.

Limitations: Special supporting, back adapter and inside flange nuts are required for the proper mounting of these types of wheels subject to limitations of 1910.215(c)(4) (i) and (ii).

(ii) Mounts which are affixed to the wheel by the manufacturing may not require an inside nut and shall not be reused.

Definitions applicable to 1910.216, Mills and calendars in the rubber and plastics industries:

Bite. The nip point between any inrunning rolls.

Calender. A machine equipped with two or more metal rolls revolving in opposite directions and used for continuously sheeting or plying up rubber and plastics compounds and for frictioning or coating materials with rubber and plastics compounds.

Mill. A machine consisting of two adjacent metal rolls, set horizontally, which revolve in opposite directions (i.e., toward each other as viewed from above) used for the mechanical working of rubber and plastic compounds.

Definitions applicable to 1910.217, Mechanical power presses:

Adjustable barrier guard. A barrier requiring adjustment for each job or die setup.

Antirepeat. The part of the clutch/brake control system designed to limit the press to a single stroke if the tripping means is held operated. Antirepeat requires release of all tripping mechanisms before another stroke can be initiated. "Antirepeat" is also called single stroke reset or reset circuit.

Automatic feeding. When the material or part being processed is placed within or removed from the point of operation by a method or means not requiring action by an operator on each stroke of the press.

Brake. The mechanism used on a mechanical power press to stop and/or hold the crankshaft, either directly or through a gear train, when the clutch is disengaged.

Brake monitor. A sensor designed, constructed, and arranged to monitor the effectiveness of the press braking system.

Bolster plate. The plate attached to the top of the bed of the press having drilled holes or T-slots for attaching the lower die or die shoe.

Clutch. The coupling mechanism used on a mechanical power press to couple the flywheel to the crankshaft, either directly or through a gear train.

Concurrent. Acting in conjunction, and is used to describe a situation wherein two or more controls exist in an operated condition at the same time.

Continuous. Uninterrupted multiple strokes of the slide without intervening stops (or other clutch control action) at the end of individual strokes.

Counterbalance. The mechanism that is used to balance or support the weight of the connecting rods, slide, and slide attachments.

Control system. Sensors, manual input and mode selection elements, interlocking and decision-making circuitry, and output elements to the press operating mechanism.

Device. A press control or attachment that:

(i) Restrains the operator from inadvertently reaching into the point of operation:

(ii) Prevents normal press operation if the operator's hand are inadvertently within the point operation; or

(iii) Automatically withdraws the operator's hands if the operator's hands are inadvertently within the point of operation as the dies close.

Die. The tooling used in a press for cutting or forming material. An upper and a lower die make a complete set.

Die builder. Any person who builds dies for power presses.

Die enclosure guard. An enclosure attached to the die show or stripper, or both, in a fixed position.

Die set. A tool holder held in alignment by guide posts and bushing and consisting of a lower shoe, an upper shoe or punch holder, and guide posts and bushing.

Die setter. An individual who places or removes dies in or from mechanical power presses, and who, as a part of his duties, makes the necessary adjustments to cause the tooling to function properly and safely.

Die setting. The process of placing or removing dies in or from a mechanical power press, and the process of adjusting the dies, other tooling and safeguarding means to cause them to function properly and safely.

Die shoe. A plate or block upon which a die holder is mounted. A die shoe functions primarily as a base for the complete die assembly, and, when used, is bolted or clamped to the bolster plate or the face of slide.

Direct drive. The type of driving arrangement wherein no clutch is used; coupling and decoupling of the driving torque is accomplished by energization and deenergization of a motor. Even though not employing a clutch, direct drives match the operational characteristics of "part revolution clutches" because the driving power may be disengaged during the stroke of the press.

Ejector. A mechanism for removing work or material from between the dies.

Face or slide. The bottom surface of the slide to which the punch or upper die is generally attached.

Feeding. The process of placing or removing material within or from the point of operation.

Fixed barrier. A die space barrier attached to the press frame.

Foot control. The foot operated control mechanism designed to be used with a clutch or clutch/brake control system.

Foot pedal. The foot operated lever designed to operate the mechanical linkage that trips a full revolution clutch.

Full revolution clutch. A type of clutch that, when tripped, cannot be disengaged until the crankshaft has completed a full revolution and the press slide a full stroke.

Gate or movable barrier device. A movable barrier arranged to enclose the point of operation before the press stroke can be started.

Guide post. The pin attached to the upper or lower die shoe, operating within the bushing on the opposing die shoe, to maintain the alignment of the upper and lower dies.

Guard. A barrier that prevents entry of the operator's hands or fingers into the point of operation.

Hand feeding tool. Any hand held tool designed for placing or removing material or parts to be processed within or from the point of operation.

Holdout or restraint device. A mechanism, including attachments for operator's hands, that when anchored and adjusted prevent the operator's hands from entering the point of operation.

Inch. An intermittent motion imparted to the slide (on machines using part revolution clutches) which is a function used by the die setter for setup of dies and tooling, but is not intended for use during production operations by the operator.

Interlocked press barrier guard. A barrier attached to the press frame and interlocked so that the press stroke cannot be started normally unless the guard itself, or its hinged or movable sections, enclose the point of operation.

Jog. An intermittent motion imparted to the slide by momentary operation of the drive motor, after the clutch is engaged with the flywheel at rest.

Knockout. A mechanism for releasing material from either die.

Liftout. The mechanism also known as knockout.

Manual feeding. When the material or part being processed is handled by the operator on each stroke of the press.

Operator's station. The complete complement of controls used by or available to an operator on a given operation for stroking the press.

Part revolution clutch. A type of clutch that can be disengaged at any point before the crankshaft has completed a full revolution and the press slide a full stroke.

Pinch point. Any point other than the point of operation at which it is possible for a part of the body to be caught.

Point of operation. The area of the press where material is actually positioned and work is being performed during any process such as shearing, punching, forming, or assembling.

Presence sensing device. A device designed, constructed and arranged to create a sensing field or area and to deactivate the clutch control of the press when an operator's hand or any other parts of his body is within such field or area.

Press. A mechanically powered machine that shears, punches, forms or assembles metal or other material by means of cutting, shaping, or combination dies attached to slides. A press consists of a stationary bed or anvil, and a slide (or slides) having a controlled reciprocating motion toward and away from the bed surface, the slide being guided in a definite path by the frame of the press.

Pull-out device. A mechanism attached to the operator's hands and connected to the upper die or slide of the press, that is designed, when properly adjusted, to withdraw the operator's hands as the dies close, if the operator's hands are inadvertently within the point of operation.

Repeat. An unintended or unexpected successive stroke of the press resulting from a malfunction.

Safety block. A prop that, when inserted between the upper and lower dies or between the bolster place and the face of the slide, prevents the slide from falling of its own deadweight.

Semiautomatic feeding. When the material or part being processed is placed within or removed from point of operation by an auxiliary means controlled by operator on each stroke of the press.

Single stroke. One complete stroke of the slide, usually initiated from a full open (or up) position, followed by closing (or down), and then a return to the full open position.

Single stroke mechanism. An arrangement used on a full revolution clutch to limit the travel of the slide to one complete stroke at each engagement of the clutch.

Slide. The main reciprocating press member. A slide is also called a ram, plunger, or platen.

Stop control. An operator control designed to immediately deactivate the clutch control and activate the brake to stop slide motion.

Stripper. A mechanism or die part for removing the parts or material from the punch.

Stroking selector. The part of the clutch/brake control that determines the type of stroking when the operating means is actuated. The stroking selector generally includes positions for "Off" (Clutch Control), "Inch," "Single Stroke," and "Continuous" (when Continuous is furnished).

Sweep device. A single or double arm (rod) attached to the upper die or slide of the press and designed to move the operator's hands to a safe position as the dies close, if the operator's hands are inadvertently within the point of operation.

Trip or (tripping). Activation of the clutch to "run" press.

Turnover bar. A bar used in die setting to manually turn the crankshaft of the press.

Two hand control device. A two hand trip that further requires concurrent pressure from both hands of the operator during a substantial part of the die-closing portion of the stroke of the press.

Two-hand trip. A clutch actuating means requiring the concurrent use of both hands of the operator to trip the press.

Unitized tooling. A type of die in which the upper and lower members are incorporated into a selfcontained unit so arranged as to hold the die members in alignment.

Definitions applicable to 1910.218, Forging machines:

Bolt-headers. The same as an upsetter or forging machine except that the diameter of stock fed into the machine is much smaller, i.e., commonly three-fourths inch or less.

Forging. Forming metal into a desired shape by impact or pressure in hammers, forging machines (upsetters), presses, rolls, and related forming equipment. Forging hammers, counterblow equipment and high-energy-rate forging machines impart impact to the workpiece, while most other types of forging equipment impart squeeze pressure in shaping the stock. Some metals can be forged at room temperature, but the majority of metals are made more plastic for forging by heating.

Forging presses. A class of forging equipment wherein the shaping of metal between dies is performed by mechanical or hydraulic pressure, and usually is accomplished with a single workstroke of the press for each die station.

Forging rolls. A class of auxiliary forging equipment wherein stock is shaped between power driven rolls bearing contoured dies. Usually used for preforming, roll forging is often employed to reduce thickness and increase length of stock.

Gravity hammers. A class of forging hammer wherein energy for forging is obtained by the mass and velocity of a freely falling ram and the attached upper die. Examples: board hammers and air-lift hammers.

High-energy-rate forging machines. A class of forging equipment wherein high ram velocities resulting from the sudden release of a compressed gas against a free piston impart to the workpiece.

Open frame hammers (or blacksmith hammers). Hammers used primarily for the shaping of forgings by means of impact with flat dies.

Ring rolls. A class for forging equipment used for shaping weldless rings from pierced discs or thick-walled, ring-shaped blanks between rolls which control wall thickness, ring diameter, height and contour.

Rivet making machines. The same as upsetters and boltheaders when producing rivets with stock diameter of 1-inch diameter is usually a cold forging operation, and therefore not included in this subpart.

Steam hammers. A type of drop hammer where the ram is raised for each stroke by a double-action steam cylinder and the energy delivered to the workpiece is supplied by the velocity and weight of the ram and attached upper die driven downward by steam pressure. Energy delivered during each stroke may be varied.

Trimming presses. A class of auxiliary forging equipment which removes flash or excess metal from a forging. This trimming operation can also be done cold, as can coining, a product sizing operation.

Upsetter (or forging machines, or headers). Forging equipment, related to the mechanical press, in which the main forming energy is applied horizontally to the workpiece which is gripped and held by prior action of the dies.

Definitions applicable to 1910.219, Mechanical power transmission apparatus:

Belts. All power transmission belts, such as flat belts, round belts, V-belts, etc., unless otherwise specified.

Belt pole (sometimes called a "belt shipper" or "shipper pole"). A device used in shifting belts on and off fixed pulleys on line or countershaft where there are no loose pulleys.

Belt shifter. A device for mechanically shifting belts from tight to loose pulleys or vice versa, or for shifting belts on cones of speed pulleys.

Exposed to contact. When the location of an object is such that a person is likely to come into contact with it and be injured.

Flywheels. Flywheels, balance wheels, and flywheel pulleys mounted and revolving on crankshaft of engine or other shafting.

Maintenance runway. Any permanent runway or platform used for oiling, maintenance, running, adjustment, or repair work, but not for a passageway.

Nip-point belt and pulley guard. A device which encloses the pulley and is provided with rounded or rolled edge slots through which the belt passes.

Point of operating. That point at which cutting, shaping, or forming is accomplished upon the stock and shall include such other points as may offer a hazard to the operator in inserting or manipulating the stock in the operation of the machine.

Prime movers. Steam, gas, oil, and air engines, motors, steam and hydraulic turbines, and other equipment used as a source of power.

Sheaves. Grooved pulleys, unless used as flywheels.

1910.212 – GENERAL REQUIREMENTS FOR ALL MACHINES

	YES	NO
(a) Machine Guarding.		
Types of Guarding. (a)(1)		
Have one or more methods of machine guarding been provided to protect the operator and other employees in the machine area from hazards such as those created by point of operation, ingoing nip points, rotating parts, flying chips and sparks? (a)(1)		
General Requirements for Machine Guards. (a)(2)		
Are guards affixed to the machine where possible and secured elsewhere if for any reason attachment to the machine is not possible? (a)(2)		
Is the guard so designed that it does not offer an accident hazard in itself? (a)(2)		
Point of Operation Guarding. (a)(3)		
NOTE: Point of operation is the area on a machine where work is actually performed upon the material being processed. (a)(3)(i)		
Is the point of operation guarded on machines whose operation exposes an employee to injury? (a)(3)(ii)		
Is the guarding device in conformity with any appropriate standards therefor, or, in the absence of such standards, is the device so designed and constructed as to prevent the operator from having any part of his body in the danger zone during the operating cycle? (a)(3)(ii)		
Are any special handtools provided for placing and removing material such as to permit easy handling of material without the operator placing a hand in the danger zone? (a)(3)(iii)		
Are precautions taken to insure that such tools are not used in lieu of other guarding required by this section? (a)(3)(iii)		
Have all of the following machines been provided with point of operation guarding:		
(a) Guillotine cutters;		
(b) Shears;		
(c) Alligator shears;		
(d) Power presses;		
(e) Milling machines;		
(f) Power saws;		
(g) Jointers;		
(h) Portable power tools;		
(i) Forming rolls and calendars? (a)(3)(iv)		
Barrels, Containers, and Drums. (a)(4)		
Have all revolving drums, barrels, and containers been guarded by an enclosure which is interlocked with the drive mechanism, so that the barrel, drum, or container cannot revolve unless the guard enclosure is in place? (a)(4)		
Exposure of Blades. (a)(5)		
Have all fans whose blade periphery is less than 7 feet above the floor or working level been guarded? (a)(5)		
Are such guards provided with openings no larger than one-half inch? (a)(5)		
(b) Anchoring Fixed Machinery.		
Are all machines that are designed for a fixed location securely anchored to prevent walking or moving? (b)		

1910.213 – WOODWORKING MACHINERY REQUIREMENTS

	YES	NO
(a) Machine Construction, General.		
Is each machine so constructed as to be free from sensible vibration when the largest size tool is mounted and run idle at full speed? (a)(1)		
Are arbors and mandrels constructed so as to have firm and secure bearing and be free from play? (a)(2)		
Are all automatic cutoff saws that stroke continuously without the operator being able to control each stroke prohibited from being used? (a)(4)		
Are all saw frames or tables so constructed with lugs cast on the frame, or with an equivalent means to limit the size of the saw blade that can be mounted which will then prevent overspeeding caused by mounting a saw larger than intended? (a)(5)		
Are all circular saw fences so constructed that they can be firmly secured to the table or table assembly without changing their alignment with the saw? (a)(6)		
For saws with tilting tables or tilting arbors, has the fence been constructed so that it will remain in a line parallel with the saw, regardless of the angle of the saw with the table? (a)(6)		
Have all circular saw gages been so constructed as to slide in grooves or tracks that are accurately machined, to insure exact alignment with the saw for all positions of the guide? (a)(7)		
Are all hinged saw tables so constructed that the table can be firmly secured in any position and in true alignment with the saw? (a)(8)		
Are all belts, pulleys, gears, shafts, and moving parts guarded in accordance with the specific requirements of 1910.219, which follows in normal sequence in this checklist? (a)(9)		
Is each power-driven woodworking machine provided with a disconnect switch that can be locked in the off position? (a)(10)		
Are the frames and all exposed, non-current-carrying metal parts of portable electric woodworking machinery, that is operated at more than 90 volts to ground, grounded? (a)(11)		
Are all other portable motors driving electric tools which are held in the hand while being operated grounded if they operate at more than 90 volts to ground? (a)(11)		
Is such ground provided through the use of a separate ground wire and polarized plug and receptacle? (a)(11)		
For all circular saws where conditions are such that there is a possibility of contact with the portion of the saw either beneath or behind the table, is that portion of the saw covered with an exhaust hood, or a guard that shall be so arranged as to prevent accidental contact with the saw? (a)(12)		
Are all revolving double arbor saws fully guarded in accordance with all the requirements for circular crosscut saws or with all the requirements for circular ripsaws, according to the kind of saws mounted on the arbors? (a)(13)		

10.213 – WOODWORKING MACHINERY REQUIREMENTS

(a) Machine Construction, General.

YES NO

e precautions taken to insure that no saw, cutter head, or ol collar is placed or mounted on a machine arbor unless e tool has been accurately machined to size and shape to the arbor? (a)(14)

e combs (featherboards) or suitable jigs provided at the orkplace for use when a standard guard cannot be used, as dadoing, grooving, jointing, moulding, and rabbeting? (a)(15)

) Machine Controls and Equipment.

a mechanical or electrical power control provided on ch machine to make it possible for the operator to cut off e power from each machine without leaving his position the point of operation? (b)(1)

n machines driven by belts and shafting, is a locking-type lt shifter or an equivalent positive device used? (b)(2)

n applications where injury to the operator might result if otors were to restart after power failures, have provisions een made to prevent machines from automatically restartg upon restoration of power? (b)(3)

re power controls and operating controls located within sy reach of the operator while he is at his regular work cation? (b)(4)

OTE: The above **does not** apply to constant pressure conols used only for setup purposes.

n each machine operated by electric motors are positive eans provided for rendering such controls or devices inoprative while repairs or adjustments are being made to the achines they control? (b)(5)

re feed rolls or other moving parts on feeder attachments covered or guarded as to protect the operator from hazrdous points? (b)(6)

) Hand-Fed Ripsaws.

each circular hand-fed ripsaw guarded by a hood which ompletely encloses that portion of the saw above the tae, and that portion of the saw above the material being ut? (c)(1)

the hood and its mounting so arranged that the hood will utomatically adjust itself to the thickness of, and remain contact with, the material being cut? (c)(1)

re provisions made to insure that the hood and its mountng does not offer any considerable resistance to insertion f material to saw, or to passage of the material being wed? (c)(1)

the hood made of adequate strength to resist blows and trains incidental to reasonable operations, adjusting, and andling? (c)(1)

it so designed as to protect the operator from flying plinters and broken saw teeth? (c)(1)

the hood made of material that is soft enough so that it ill be unlikely to cause tooth breakage? (c)(1)

the hood so mounted as to insure that its operation will e positive, reliable, and in true alignment with the saw? (c)(1)

1910.213 – WOODWORKING MACHINERY REQUIREMENTS

(c) Hand-Fed Ripsaws.

YES NO

Is the mounting adequate in strength to resist any reasonable side thrust or other force tending to throw it out of line? (c)(1)

Is each hand-fed circular ripsaw furnished with a spreader to prevent material from squeezing the saw or being thrown back on the operator? (c)(2)

Is the spreader made of hard tempered steel, or its equivalent, and is it thinner than the saw kerf? (c)(2)

Is the spreader of sufficient width to provide adequate stiffness or rigidity to resist any reasonable side thrust or blow tending to bend or throw it out of position? (c)(2)

Is the spreader so attached that it will remain in true alignment with the saw, even when either the saw or table is tilted? (c)(2)

Where a saw is used for dadoing, grooving, or rabbeting, are procedures established whereby the spreader will immediately be replaced upon the saw? (c)(2)

Is each hand-fed circular ripsaw provided with nonkickback fingers or dogs so located as to oppose the thrust or tendency of the saw to pick up the material or to throw it back toward the operator? (c)(3)

Are all such nonkickback fingers or dogs so designed as to provide adequate holding power for all the thicknesses of materials being cut? (c)(3)

(d) Hand-Fed Crosscut Table Saws.

Is each hand-fed circular crosscut table saw guarded by a hood, as required by the items under 1910.213(c)(1) above? (d)(1)

(e) Circular Resaws.

Is each circular resaw guarded by a hood or shield of metal above the saw? (e)(1)

Is this hood or shield so designed as to guard against danger from flying splinters or broken saw teeth? (e)(1)

Is each circular resaw (other than self-feed saws with a roller or wheel at the back of the saw) provided with a spreader fastened securely behind the saw? (e)(2)

Is this spreader slightly thinner than the saw kerf and slightly thicker than the saw disk? (e)(2)

(f) Self-Feed Circular Saws.

Are feed rolls and saws protected by a hood or guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point? (f)(1)

Is such guard constructed of heavy material, and does the bottom of the guard come down to within three-eighths inch of the plane formed by the bottom or working surfaces of the feed rolls? (f)(1)

1910.213 – WOODWORKING MACHINERY REQUIREMENTS

(f) Self-Feed Circular Saws.

	YES	NO
This distance may be increased to three-fourths inch, provided the lead edge of the hood is extended to not less than 5½ inches in front of the nip point between the front roll and the work. (f)(1)		
Is each self-feed circular ripsaw provided with sectional nonkickback fingers for the full width of the feed rolls? (f)(2)		
Are such nonkickback fingers located in front of the saw, and so arranged as to be in continual contact with the wood being fed? (f)(2)		
(g) Swing Cutoff Saws.		
The following requirements are also applicable to sliding cutoff saws mounted above the table. (g)		
Is each swing cutoff saw provided with a hood that is completely enclosing the upper half of the saw, the arbor end, and the point of operation at all positions of the saw? (g)(1)		
Is the hood constructed in such a manner and of such material that it will protect the operator from flying splinters and broken saw teeth? (g)(1)		
Is the hood so designed that it will automatically cover the lower portion of the blade, so that when the saw is returned to the back of the table the hood will rise on top of the fence, and when the saw is moved forward the hood will drop on top of and remain in contact with the table or material being cut? (g)(1)		
Is each swing cutoff saw provided with an effective device to return the saw automatically to the back of the table when released at any point of its travel? (g)(2)		
Does such device depend on things other than any rope, cord, or spring? (g)(2)		
If there is a counterweight on such device, are the bolts supporting the bar and counterweight provided with cotter pins? (g)(2)		
Is such counterweight prevented from dropping by either a bolt passing through both the bar and counterweight, or a bolt put through the extreme end of the bar, or, where the counterweight does not encircle the bar, a safety chain attached to it? (g)(2)		
Are limit chains or other equally effective means provided to prevent the saw from swinging beyond the front or back edges of the table, or beyond a forward position where the gullets of the lowest saw teeth will rise above the table top? (g)(3)		
Are inverted swing cutoff saws provided with a hood that will cover the part of the saw that protrudes above the top of the table, or above the material being cut? (g)(4)		
Does such hood automatically adjust itself to the thickness of and remain in contact with the material being cut? (g)(4)		
(h) Radial Saws.		
Does the upper hood completely enclose the upper portion of the blade down to a point that will include the end of the saw arbor? (h)(1)		
Is the upper hood constructed in such a manner and of such material that it will protect the operator from flying splinters, broken saw teeth, etc., and will deflect sawdust away from the operator? (h)(1)		

1910.213 – WOODWORKING MACHINERY REQUIREMENTS

(h) Radial Saws.

	YES	NO
Are the sides of the lower exposed portion of the blade guarded to the full diameter of the blade by a device that will automatically adjust itself to the thickness of the stock and remain in contact with the stock being cut, to give maximum protection possible for the operation being performed? (h)(1)		
Is each radial saw used for ripping provided with nonkickback fingers or dogs located on both sides of the saw, so as to oppose the thrust or tendency of the saw to pick up the material or to throw it back toward the operator? (h)(2)		
Are such nonkickback fingers or dogs designed to provide adequate holding power for all the thicknesses of material being cut? (h)(2)		
Is an adjustable stop provided to prevent the forward travel of the blade beyond the position necessary to complete the cut in repetitive operations? (h)(3)		
Is the saw so installed in such a manner that the front end of the unit will be slightly higher than the rear, so as to cause the cutting head to return gently to the starting position when released by the operator? (h)(4)		
Are precautions taken to insure that ripping and ploughing shall be against the direction in which the saw turns? (h)(5)		
Is the direction of the saw rotation conspicuously marked on the hood? (h)(5)		
Is a permanent label not less than 1½ inches by 3/4 inch affixed to the end of the guard at which the blade teeth exit the upper guard during the operation of the saw, and at approximately the level of the arbor? (h)(5)		
Does such label read: "Danger: Do Not Rip or Plough From This End"? (h)(5)		
(i) Bandsaws and Band Resaws.		
Except for the working portion of the blade between the bottom of the guide rolls and the table, are all portions of the saw blade enclosed or guarded? (i)(1)		
Are bandsaw wheels fully encased? (i)(1)		
Is the outside periphery of the enclosure solid? (i)(1)		
Is the front and back of the band wheels either enclosed by solid material or by wire mesh or perforated metal? (i)(1)		
Is such mesh or perforated metal of not less than 0.037 inch (U.S. Gage No. 20), and are the openings not greater than three-eighths inch? (i)(1)		
Is solid material used for this purpose of an equivalent strength and firmness as the above metal? (i)(1)		
Does the guard for the portion of the blade between the sliding guide and the upper-saw-wheel guard protect the saw blade at the front and outer side? (i)(1)		
Is such guard self-adjusting and does it raise and lower with the guide? (i)(1)		
Is the upper-wheel guard made to conform to the travel of the saw on the wheel, (i)(1)		

1910.213 – WOODWORKING MACHINERY REQUIREMENTS

(i) Bandsaws and Bank Resaws.

Is each bandsaw provided with a tension control device to indicate a proper tension for the standard saws used on the machine? (i)(2)

Are feed rolls of band resaws protected with a suitable guard to prevent the hands of the operator from coming in contact with the in-running rolls at any point? (i)(3)

Is the guard constructed of heavy material, preferably metal, and does the edge of the guard come to within three-eighths inch of the plane formed by the inside face of the feed roll in contact with the stock being cut? (i)(3)

(j) Jointers.

Is each hand-fed planer and jointer with a horizontal head equipped with a cylindrical cutting head, the knife projection of which does not exceed one-eighth inch beyond the cylindrical body of the head? (j)(1)

Is the opening in the table kept as small as possible? (j)(2)

Is the clearance between the edge of the rear table and the cutter head not more than one-eighth inch? (j)(2)

Is the table throat opening not more than 2½ inches when tables are set or aligned with each other for zero cut? (j)(2)

Does each hand-fed jointer with a horizontal cutting head have an automatic guard which will cover all the section of the head on the working side of the fence or gage? (j)(3)

Does such guard effectively keep the operator's hand from coming in contact with the revolving knives? (j)(3)

Does the guard automatically adjust itself to cover the unused portion of the head, and does it remain in contact with the material at all times? (j)(3)

Is each hand-fed jointer with horizontal cutting head equipped with a guard which will cover the section of the head back of the gage or fence? (j)(4)

Is each wood jointer with vertical head equipped with either an exhaust hood or other guard, so arranged as to enclose completely the revolving head, except for a slot of such width as may be necessary and convenient for the application of the material to be jointed? (j)(5)

(k) Tenoning Machines.

Are feed chains and sprockets of all double end tenoning machines completely enclosed, except for that portion of chain used for conveying the stock? (k)(1)

Are sprockets and chains at the rear ends of frames over which feed conveyors run guarded at the sides by plates projecting beyond the periphery of sprockets and the ends of lugs? (k)(2)

Are all cutting heads, and saws if used, on tenoning machines covered by metal guards? (k)(3)

Do these guards cover at least the unused part of the periphery of the cutting head? (k)(3)

If such guard is constructed of sheet metal, is the material used at least one-sixteenth inch in thickness, and if cast iron is used is it at least three-sixteenths inch in thickness? (k)(3)

Where an exhaust system is used, does the guard form part or all of the exhaust hood and is it constructed of metal of a thickness not less than that specified in the item immediately above? (k)(4)

(l) Boring and Mortising Machines.

Are safety-bit chucks with no projecting set screws used? (l)(1)

Are boring pits provided with a guard that will enclose all portions of the bit and chuck above the material being worked? (l)(2)

Is the top of the cutting chain and driving mechanism enclosed? (l)(3)

Are any of the following or equivalent means used to prevent the dropping of any counterweight when used:

(i) Is it bolted to the bar by means of a bolt passing through both bar and the counterweight?
(ii) Is a bolt put through the extreme end of the bar?
(iii) Where the counterweight does not encircle the bar is a safety chain attached to it?
(iv) Are other types of counterweights suspended by chain or wire rope, and do they travel in a pipe or other suitable enclosure wherever they might fall and cause injury? (l)(4)

Are universal joints on spindles of boring machines completely enclosed in such a way as to prevent accidental contact by the operator? (l)(5)

Is each operating treadle covered by an inverted U-shaped metal guard, fastened to the floor, and of adequate size to prevent accidental tripping? (l)(6)

(m) Wood Shapers and Similar Equipment.

Are the cutting heads of each wood shaper, hand-fed panel raiser, or other similar machines not automatically fed, enclosed with a cage or adjustable guard so designed as to keep the operator's hand away from the cutting edge? (m)(1)

Is the diameter of a circular shaper guard not less than the greatest diameter of the cutter? (m)(1)

Is the use of a warning device of leather or other material attached to the spindle prohibited? (m)(1)

Are all double-spindle shapers provided with a spindle starting and stopping device for each spindle? (m)(3)

(n) Planing, Molding, Stickling, and Matching Machines.

Does each planing, molding, stickling, and matching machine have all cutting heads, and saws if used, covered by a metal guard? (n)(1)

If such guard is constructed of sheet metal, is the material at least 1/16 inch in thickness, and if cast iron is used is it at least three-sixteenths inch in thickness? (n)(1)

Where an exhaust system is used, do the guards form part or all of the exhaust hood and are they constructed of metal of a thickness not less than that specified in the item immediately above? (n)(2)

Are feed rolls guarded by a hood or suitable guard to prevent the hands of an operator from coming in contact with the in-running rolls at any point? (n)(3)

	YES	NO
Is such guard fastened to the frame carrying the rolls so as to remain in adjustment for any thickness of stock? (n)(3)		
Are surfacers or planers used in thicknessing multiple pieces of material simultaneously provided with sectional infeed rolls having sufficient yield in the construction of the sections to provide feeding contact pressure on the stock, over the permissible range of variation in stock thickness specified or for which the machine is designed? (n)(4)		
In lieu of such yielding sectional rolls, are suitable section kickback finger devices provided at the infeed end? (n)(4)		
(o) Profile and Swing-Head Lathes and Wood Heel Turning Machines.		
Does each profile and swing-head lathe have all cutting heads covered by a metal guard? (o)(1)		
If such guard is constructed of sheet metal is the material used at least one-sixteenth inch in thickness, and if it is cast iron, is it at least three-sixteenths inch in thickness? (o)(1)		
Are cutting heads on wood-turning lathes, whether rotating or not, covered as completely as possible by hoods or shields? (o)(2)		
Are shoe last and spoke lathes, doweling machines, wood heel turning machines, and other automatic wood-turning lathes of the rotating knife type equipped with hoods enclosing the cutter blades completely except at the contact points while the stock is being cut? (o)(3)		
Are lathes that are used for turning long pieces of wood stock held only between the two centers equipped with long curved guards extending over the tops of the lathes, in order to prevent the work pieces from being thrown out of the machines if they should become loose? (o)(4)		
Where an exhaust system is used, do the guards form part or all of the exhaust hood and are they constructed of metal of the thickness as specified in item (1) above? (o)(5)		
(p) Sanding Machines.		
Are the feed rolls of self-feed sanding machines protected with a semicylindrical guard to prevent the hands of the operator from coming in contact with the inrunning rolls at any point? (p)(1)		
Is the guard constructed of heavy material, preferably metal, and firmly secured to the frame carrying the rolls so as to remain in adjustment for any thickness of stock? (p)(1)		
Does the bottom of the guard extend to within three-eighths inch of a plane formed by the bottom or contact face of the feed roll where it touches the stock? (p)(1)		
Does each drum sanding machine have an exhaust hood, or other guard if no exhaust system is required? (p)(2)		
Is such exhaust hood or other guard so arranged as to enclose the revolving drum, except for that portion of the drum above the table? (p)(2)		
Does each disk sanding machine have an exhaust hood, or other guard if no exhaust system is required? (p)(3)		
Is such exhaust hood or other guard so arranged as to enclose the revolving disk, except for that portion of the disk above the table? (p)(3)		

	YES	NO
Are belt sanding machines provided with guards at each nip point where the sanding belt runs onto a pulley? (p)(4)		
Do these guards effectively prevent the hands or fingers of the operator from coming in contact with the nip points? (p)(4)		
Is the unused run of the sanding belt guarded against accidental contact? (p)(4)		
(q) Veneer Cutters and Wringers.		
Are veneer slicer knives guarded to prevent accidental contact with knife edge, at both front and rear? (q)(1)		
If veneer clippers are not equipped with an automatic feed, are they provided with a guard which will make it impossible to place a finger or fingers under the knife while feeding or removing the stock? (q)(2)		
Are sprockets on chain or slat-belt conveyors enclosed? (q)(3)		
Are hand and foot-power guillotine veneer cutters provided with rods or plates or other satisfactory means, so arranged on the feeding side that the hands cannot reach the cutting edge of the knife while feeding or holding the stock in place? (q)(4)		
Are power-driven guillotine veneer cutters, except continuous feed trimmers, equipped with one of the following:		
(i) A starting device which requires the simultaneous action of both hands to start the cutting motion and at least one hand on a control during the complete stroke of the knife; or		
(ii) An automatic guard which will remove the hands of the operator from the danger zone at every descent of the blade?		
Is such guard used in conjunction with one-hand starting devices which require two distinct movements of the device to start the cutting motion?		
Is such guard so designed as to return positively to the nonstarting position after each complete cycle of the knife? (q)(5)		
Where two or more workers are employed at the same time on the same power-driven guillotine veneer cutter equipped with two-hand control, is the device so arranged that each worker is required to use both hands simultaneously on the controls to start the cutting motion, and at least one hand on a control to complete the cut? (q)(6)		
Are power-driven guillotine veneer cutters, other than continuous trimmers, provided with an emergency device which will prevent the machine from operating in the event of failure of the brake when the starting mechanism is in the nonstarting position? (q)(7) NOTE: This is in addition to the brake or other stopping mechanism.		
(r) Miscellaneous Woodworking Machines.		
Are the feed rolls of the roll type glue spreaders guarded by a semicylindrical guard? (r)(1)		
Does the bottom of the guard come to within three-eighths inch of a plane formed by bottom or contact face of the feed roll where it touches the stock? (r)(1)		

1910.213 – WOODWORKING MACHINERY REQUIREMENTS

(r) Miscellaneous Woodworking Machines.

	YES	NO
Are drag saws so located as to give at least a 4-foot clearance for passage when the saw is at the extreme end of the stroke, or as an alternative, if such clearance is not obtainable is the saw and its driving mechanism provided with a standard enclosure? (r)(2)		
For combination or universal woodworking machines, is each point of operation of any tool guarded as required for such a tool in a separate machine? (r)(3)		
Are all other woodworking machines that are not specifically mentioned in items (a) through (q) and (r), provided with suitable guards and exhaust hoods to reduce to a minimum the hazard due to the point of operation of such machines? (r)(4)		

(s) Inspection and Maintenance of Woodworking Machinery.

	YES	NO
Are all dull, badly set, improperly filed, or improperly tensioned saws immediately removed from service? (s)(1)		
Are all saws to which gum has adhered on the sides immediately cleaned? (s)(1)		
Are all knives and cutting heads of woodworking machines kept sharp, properly adjusted, and firmly secured? (s)(2)		
Where two or more knives are used in one head, are they kept properly balanced? (s)(2)		
Are all bearings kept free from lost motion and are they well lubricated? (s)(3)		
Are arbors of all circular saws free from play? (s)(4)		
Is sharpening or tensioning of saw blades or cutters done only by persons of demonstrated skill in this work? (s)(5)		
Is emphasis placed upon the importance of maintaining cleanliness around woodworking machinery, particularly as regards the effective functioning of guards and the prevention of fire hazards in switch enclosures, bearings, and motors? (s)(6)		
Are all cracked saws removed from service? (s)(7)		
Is the practice of inserting wedges between the saw disk and the collar to form what is commonly known as a "wobble saw" prohibited? (s)(8)		
Are push sticks or push blocks provided at the work place in the several sizes and types suitable for the work to be done? (s)(9)		
Is the knife blade of jointers so installed and adjusted that it does not protrude more than one-eighth inch beyond the cylindrical body of the head? (s)(12)		
Are push sticks or push blocks provided at the work place in the several sizes and types suitable for the work to be done? (s)(12)		
Whenever veneer slicers or rotary veneer-cutting machines have been shut down for the purpose of inserting logs or to make adjustments, are operators required to make sure that the machine is clear and other workmen are not in a hazardous position before starting the machine? (s)(13)		

1910.215 – ABRASIVE WHEEL MACHINERY

(a) General Requirements.

	YES	NO
Machine Guarding. (a)(1)		
Are abrasive wheels used only on machines provided with safety guards, except: (i) Wheels used for internal work while within the work being ground; (ii) Mounted wheels, used in portable operations, 2 inches and smaller in diameter; and (iii) Types 16, 17, 18, 18R, and 19 cones, plugs, and threaded hole pot balls where the work offers protection? (a)(1)		
Guard Design. (a)(2)		
Does the safety guard cover the spindle end, nut, and flange projections? (a)(2)		
Is the safety guard so mounted as to maintain a proper alignment with the wheel? (a)(2)		
Does the strength of the fastenings exceed the strength of the guard, except: (i) Where the work provides a suitable measure of protection to the operator, the guards may be so constructed that the spindle end, nut, and outer flange are exposed; and where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted; and (ii) The spindle end, nut, and outer flange may be exposed on machines designed as portable saws? (a)(2)		
Flanges. (a)(3)		
Are grinding machines equipped with flanges in accordance with the items under paragraph (c) of this checklist? (a)(3)		
Work Rests. (a)(4)		
Are work rests provided on all offhand grinding machines to support the work? (a)(4)		
Are work rests of rigid construction and designed to be adjustable to compensate for wheel wear? (a)(4)		
Are work rests kept adjusted closely to the wheel, with a maximum opening of one-eighth inch? (a)(4)		
Is the work rest securely clamped after each adjustment? (a)(4)		
Is adjustment of the work rest prohibited when the wheel is in motion? (a)(4)		
Excluded Machinery. (a)(5)		
Natural sandstone wheels and metal, wooden, cloth, or paper discs, having a layer of abrasive on the surface are not covered by this section. (a)(5)		

YES NO

(b) Guarding of Abrasive Wheel Machinery.

Cup Wheels. **(b)(1)**

Are Types 6 and 11 cup wheels protected by one of the following?

(i) Safety guards as specified in items (1) through (10) which follow?
(ii) Band type guards as specified in (11) below?
(iii) A special "Revolving Cup Guard" which mounts behind the wheel and turns with it?
Are such revolving cup guards made of steel or other material with adequate strength, and do they enclose the wheel sides upward from the back for one-third of the wheel thickness? **(b)(1)**

Is there at least one-sixteenth inch clearance between the wheel side and the guard? **(b)(1)**

Guard Exposure Angles. **(b)(2)**

Are the maximum exposure angles as specified in items (3) through (8) which follow prohibited from being exceeded? **(b)(2)**

Bench and Floor Stands. **(b)(3)**

Is the angular exposure of the grinding wheel periphery and sides for safety guards limited to not more than 90°, or one-fourth of the periphery? **(b)(3)**

Is such exposure as shown in Figures O-6 and O-7? (See Appendix.) **(b)(3)**

If the nature of the work requires contact with the wheel below the horizontal plane of the spindle, is the exposure as shown in Figures O-8 and O-9? (See Appendix.) **(b)(3)**

Cylindrical Grinders. **(b)(4)**

Is the maximum angular exposure of the grinding wheel periphery and sides for safety guards limited to 180°? **(b)(4)**

Is this exposure as shown in Figures O-10 and O-11? (See Appendix.) **(b)(4)**

Surface Grinders and Cutting-Off Machines. **(b)(5)**

Is the maximum angular exposure of the grinding wheel periphery and sides for safety guards limited to not more than 150°? **(b)(5)**

Is the wheel exposure as shown in Figures O-12 and O-13? (See Appendix.) **(b)(5)**

YES NO

Swing Frame Grinders. **(b)(6)**

Does the maximum angular exposure of the grinding wheel periphery and sides for safety guards not exceed 180°? **(b)(6)**

Is the top half of the wheel enclosed at all times as shown in Figures O-14 and O-15? (See Appendix.) **(b)(6)**

Automatic Snagging Machines. **(b)(7)**

Is the maximum angular exposure of the grinding wheel periphery and sides for safety guards limited to not more than 180°? **(b)(7)**

Is the top half of the wheel enclosed at all times as shown in Figures O-14 and O-15? (See Appendix.) **(b)(7)**

Top Grinding. **(b)(8)**

Where the work is applied to the top of the wheel above the horizontal centerline, is the exposure of the grinding wheel periphery limited to not more than 60°, as shown in Figures O-16 and O-17? (See Appendix.) **(b)(8)**

Exposure Adjustment. **(b)(9)**

On grinding wheels where the operator stands in front of the opening, are safety guards so constructed that they can be adjusted to the constantly decreasing diameter of the wheel? **(b)(9)**

Are precautions taken to insure that the maximum angular exposure above the horizontal plane of the wheel spindle, as indicated in items (3) and (4) above will never be exceeded? **(b)(9)**

Are precautions taken to insure that the distance between the wheel periphery and the adjustable tongue or the end of the peripheral member at the top never exceeds one-fourth inch, as shown in Figures O-18, O-19, O-20, O-21, O-22, and O-23? (See Appendix.) **(b)(9)**

Material Requirements and Minimum Dimensions. **(b)(10)**

Are Figures O-36 and O-37 and Table O-9 (see Appendix) used to determine the minimum back thickness of the guards? **(b)(10)(i)**

If the wheel operating speed does not exceed 8,000 surface feet per minute are wheel guards made of cast iron, malleable iron, or other guards as described in item (iii) below? **(b)(10)(ii)**

Where operating speeds of wheels are faster than 8,000 surface feet per minute up to a maximum of 16,000 surface feet per minute, are guards constructed of cast steel or structural steel? **(b)(10)(iii)**

1910.215 – ABRASIVE WHEEL MACHINERY
(b) Guarding of Abrasive Wheel Machinery.

YES NO

For cutting-off wheels 16 inches in diameter and smaller, and where the speed does not exceed 16,000 surface feet per minute, are guards made of cast iron or malleable iron? (b)(10)(iv)

For cutting-off wheels larger than 16 inches in diameter, and where speed does not exceed 14,200 surface feet per minute, are safety guards as specified in Figures 0-27 and 0-28, and Table 0-1? (See Appendix.) (b)(10)(v)

On thread grinding wheels not exceeding 1 inch in thickness, are cast iron or malleable iron safety guards provided as specified in Figures 0-36 and 0-37, and Table 0-9? (See Appendix.) (b)(10)(vi)

Band Type Guards – General Specifications. (b)(11)

Are bands made of steel plate or other material of equal or greater strength? (b)(11)(i)

Are the bands continuous and the ends being either riveted, bolted, or welded together so that there are no inside projections? (b)(11)(ii)

Is the inside diameter of the band not more than 1 inch larger than the outside diameter of the wheel? (b)(11)(ii)

Is the band mounted as nearly concentric with the wheel as practicable? (b)(11)(ii)

Is the band of sufficient width and its position kept so adjusted that at no time will the wheel protrude beyond the edge of the band a distance greater than that indicated in Fig. 0-29 and in Table 0-2 (see Appendix), or the wall thickness (W), whichever is smaller? (b)(11)(iii)

Guard Design Specifications. (b)(12)

Do abrasive wheel machinery guards meet the design specifications of ANSI B-7.1-1970? (b)(12)

(c) Flanges.

General Requirements. (c)(1)

Are all abrasive wheels mounted between flanges which are less than one-third the diameter of the wheel? (c)(1)

Exceptions:

- *(a)* Mounted wheels.
- *(b)* Portable wheels with threaded inserts or projecting studs.
- *(c)* Abrasive discs.
- *(d)* Plate mounted wheels.
- *(e)* Cylinders, cup, or segmental wheels that are mounted in chucks.
- *(f)* Types 27 and 28 wheels.
- *(g)* Certain internal wheels.
- *(h)* Modified types 6 and 11 wheels.
- *(i)* Cutting-off wheels, Types 1 and 27A. (c)(1)(i)

Are Type 1 cutting-off wheels mounted between properly relieved flanges which have matching bearing surfaces? (c)(1)(ii)

Are such flanges at least one-fourth the wheel diameter? (c)(1)(ii)

Are Type 27A cutting-off wheels mounted by means of flat flanges having matching bearing surfaces? (c)(1)(iii)

Are such flanges never less than one-fourth the wheel diameter? (c)(1)(iii)

1910.215 – ABRASIVE WHEEL MACHINERY
(c) Flanges.

YES NO

For the three general types of flanges, see Figures 0-30, 0-32, and 0-34. (See Appendix.) (c)(1)(iv)

Regardless of flange types used, are blotters always used, and are wheels always guarded? (c)(1)(v)

Finish and Balance. (c)(3)

Are flanges dimensionally accurate and in good balance? (c)(3)

Are there no rough surfaces or sharp edges? (c)(3)

Uniformity of Diameter. (c)(4)

Are both flanges, of any type, between which a wheel is mounted, of the same diameter and do they have equal bearing surface, with the exceptions as follow: (c)(4)(i)

On Type 27 and Type 28 wheels, does the back flange extend beyond the central hub or raised portion and contact the wheel to counteract the side pressure on the wheel in use? (c)(4)(ii)

On Type 27 and Type 28 wheels, where the mounts are affixed to the wheel by the manufacturer, are such mounts prohibited from being reused? (c)(4)(ii)

Are Type 27 and Type 28 wheels used only with a safety guard located between the wheel and the operator during use? (c)(4)(ii)

Modified Types 6 and 11 wheels with tapered K dimension, as shown in Figures 0-4 and 0-5 (see Appendix) are not required to have flanges of the same size. (c)(4)(iii)

Recess and Undercut. (c)(5)

Are straight relieved flanges, made according to Table 0-6 and Fig. 0-32 (see Appendix) recessed at least one-sixteenth inch on the side next to the wheel for a distance as specified in Table 0-6? (See Appendix.) (c)(5)(i)

Are straight flanges of the adaptor or sleeve type undercut so that there will be no bearing on the sides of the wheel within one-eighth inch of the arbor hole? (c)(5)(ii)

NOTE: See Table 0-7 and Figures 0-33 and 0-34. (See Appendix.)

Blotters. (c)(6)

Are blotters always required to be used between flanges and abrasive wheel surfaces to insure uniform distribution of flange pressure, with the following exceptions:

- *(a)* Mounted wheels;
- *(b)* Abrasive discs;
- *(c)* Plate mounted wheels;
- *(d)* Cylinders, cups, or segmental wheels that are mounted in chucks;
- *(e)* Types 27 and 28 wheels;
- *(f)* Certain Type 1 and Type 27A cutting-off wheels;

1910.215 – ABRASIVE WHEEL MACHINERY
(c) Flanges.

YES NO

(g) Certain internal wheels;
(h) Type 4 tapered wheels;
(i) Diamond wheels, except certain vitrified diamond wheels;
(j) Modified Types 6 and 11 wheels, where the blotters are applied flat side of wheel only? (c)(6)(i)

Driving Flange. (c)(7)

Is the driving flange securely fastened to the spindle, and does the bearing surface run true? (c)(7)

Where more than one wheel is mounted between a single set of flanges, and the wheels are separated by specially designed spacers, are such spacers equal in diameter to the mounting flanges and have equal bearing surfaces? (c)(7)

Dimensions. (c)(8)

Are Tables O-4 and O-6 and Fig. 6 (see Appendix) used in determining the minimum dimension of flanges used on wheels with holes that fit directly on the spindle? (c)(8)(i)

Is Table O-5 and Figure O-31 and Table O-7 and Figures O-33 and O-34 (see Appendix) used in determining the size of flanges for wheels having holes larger than the spindle? (c)(8)(ii)

Is Table O-8 and Figure O-35 (see Appendix) used to determine the minimum dimensions for straight flanges that are an integral part of wheel sleeves? (c)(8)(iii)

Repairs and Maintenance. (c)(9)

Are all flanges maintained in good condition? (c)(9)

When the bearing surfaces become worn, warped, sprung, or damaged are they trued or refaced? (c)(9)

When refacing or truing, is care exercised to make sure that proper relief and rigidity is maintained? (c)(9)

When the proper relief or rigidity cannot be maintained, are flanges replaced? (c)(9)

(d) Mounting.

Inspection. (d)(1)

Immediately before mounting, are wheels closely inspected and sounded by the user (ring test) to make sure they have not been damaged in transit, storage, or otherwise? (d)(1)

Immediately before mounting, is the spindle speed of the machine checked to be certain that it does not exceed the maximum operating speed marked on the wheel? (d)(1)

When making the ring test, are all wheels prohibited from being used if they sound dead? (d)(1)

Are all wheels dry and free from sawdust when applying the ring test? (d)(1)(i)

Arbor Size. (d)(2)

Do grinding wheels fit freely on the spindle, and do they remain free under all grinding conditions? (d)(2)

Surface Condition. (d)(3)

Are all contact surfaces of wheels, blotters and flanges flat and free of foreign matter? (d)(3)

Bushing. (d)(4)

When bushings are used in the wheel hole, are precautions taken to insure that they do not exceed the width of the wheel, and do not contact the flanges? (d)(4)

1910.215 – ABRASIVE WHEEL MACHINERY
(d) Mounting.

YES NO

Blotters. (d)(5)

Do all blotters or flange facings of compressible material cover the entire contact area of wheel flanges? (d)(5)

Multiple Wheel Mounting. (d)(6)

When more than one wheel is mounted between a single set of flanges and the wheels are separated by specially designed spacers, are such spacers equal in diameter to the mounting flanges and have equal bearing surfaces? (d)(6)

Standard Removed by OSHA (d)(7)

1910.216 – MILLS AND CALENDERS IN THE RUBBER AND PLASTICS INDUSTRIES

(a) General Requirements.

New Installations. (a)(1)

Are all new installations, on or after August 31, 1971, in conformity with the following items in this checklist? (a)(1)

Do all existing plant installations or equipment contracted for prior to August 31, 1971 comply with the following items in this checklist? (a)(2)

Is electrical equipment and are auxiliaries installed in accordance with the provisions of subpart S of this checklist? (a)(3)

Mill Roll Heights. (a)(4)

Are all mill installations installed so that the top of the operating rolls is not less than 50 inches above the level on which the operator stands? (a)(4)

NOTE: This distance does apply to the actual working level, whether it be at the general floor level, in a pit, or on a platform.

(b) Mill Safety Controls.

Safety Trip Control. (b)(1)

Is each mill provided with a safety trip control in front and in back? Does it operate readily on contact? (b)(1)

Is the safety trip control one of the following types or a combination thereof? (b)(1)

Pressure-Sensitive Body Bars. (b)(1)(i)

Are they installed at the front and back of each mill having a 46-inch roll height or over? (b)(1)(i)

Do these bars operate readily by pressure of the mill operator's body? (b)(1)(i)

Safety Triprod. (b)(1)(ii)

Are they installed in the front and in the back of each mill and located within 2 inches of a vertical plant tangent to the front and rear rolls? (b)(1)(ii)

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(b) Mill Safety Controls.

YES NO

Are the top rods not more than 72 inches above the level on which the operator stands? (b)(1)(ii)

Are the triprods accessible and do they operate readily whether the rods are pushed or pulled? (b)(1)(ii)

Safety Tripwire Cable or Wire Center Cord. (b)(1)(iii)

Is the cable installed in the front and in the back of each mill and located within 2 inches of a vertical plane tangent to the front and rear rolls? (b)(1)(iii)

Are the cables not more than 72 inches above the level on which the operator stands? (b)(1)(iii)

Does the cable or cord operate readily whether the cable or cord is pushed or pulled? (b)(1)(iii)

Standard Removed by OSHA (b)(2)

Auxiliary Equipment. (b)(3)

Is all auxiliary equipment such as mill divider, support bars, spray pipes, feed conveyors, strip knives, etc., located in such a manner as to avoid interference with and access to and operation of safety devices? (b)(3)

(c) Calender Safety Controls.

Safety Trip, Face. (c)(1)

Is a safety triprod, cable, or wire center cord provided across each pair of inrunning rolls extending the length of the face of the rolls? (c)(1)

Is it readily accessible, and does it operate whether pushed or pulled? (c)(1)

Are the safety tripping devices located within reach of the operator and the bite? (c)(1)

Safety Trip, Side. (c)(2)

On both sides of the calender and near each end of the face of the roll, is there a cable or wire center cord connected to the safety trip? (c)(2)

Do they operate readily when pushed or pulled? (c)(2)

(d) Protection by Location.

Mills. (d)(1)

Where a mill is so installed that persons cannot normally reach through, over, under, or around to come in contact with the roll bite or be caught between a roll and an adjacent object, and if such elements are made a fixed part of a mill, the safety control devices in item (b) above **will not** apply. (d)(1)

1910.216 – MILLS AND CALENDERS IN THE RUBBER AND PLASTICS INDUSTRIES

(d) Protection by Location.

YES NO

Calenders. (d)(2)

Where a calender is so installed that persons cannot normally reach through, over, under, or around to come in contact with the roll bite or be caught between a roll and an adjacent object, and if such elements are made a fixed part of a calender, the safety control devices as required in items under paragraph (c) **do not** apply. (d)(2)

(e) Trip and Emergency Switches.

Do all trip and emergency switches require manual resetting? (e)

(f) Stopping Limits.

Determination of Distance of Travel. (f)(1)

Are all measurements on mills and calenders taken with the rolls running empty at maximum operating speed? (f)(1)

Are the stopping distances expressed in inches of surface travel of the roll from the instant the emergency stopping device is actuated? (f)(1)

Stopping Limits for Mills. (f)(2)

Are all mills irrespective of the size of the rolls or their arrangement, stopped within a distance as measured in inches of surface travel, not greater than 1½ percent of the peripheral no-load surface speeds of the respective rolls as determined in feet per minute? (f)(2)

Stopping Limits for Calenders. (f)(3)

Are all calenders, irrespective of size of the rolls or their configuration, stopped within a distance, as measured in inches of surface travel, not greater than 1-3/4 percent of the peripheral no-load surface speeds of the respective calender rolls as determined in feet per minute? (f)(3)(i)

Where speeds above 250 feet per minute as measured on the surface of the drive roll are used, are such stopping distances subject to engineering determination? (f)(3)(ii)

Standard Removed by OSHA (g)

1910.217 – MECHANICAL POWER PRESSES
(a) General Requirements.

YES NO

Reconstruction and Modification. (a)(4)

Do all mechanical power presses that have been reconstructed or modified comply with the following items in this checklist? (a)(4)

Excluded Machines. (a)(5)

The following machines are excluded from these items: Press brakes, hydraulic and pneumatic power presses, bulldozers, hot bending and hot metal presses, forging presses and hammers, riveting machines and similar types of fastener applicators. (a)(5)

(b) Mechanical Power Press Guarding and Construction, General.

Hazards to Personnel Associated With Broken or Falling Machine Components. (b)(1)

Are machine components designed, secured, or covered to minimize hazards caused by breakage, or loosening and falling or release of mechanical energy (i.e. broken springs)? (b)(1)

Brakes. (b)(2)

Are friction brakes that are provided for stopping or holding the slide movement inherently self-engaging, by requiring power or force from external source to cause disengagement? (b)(2)

Is the brake capacity sufficient to stop the motion of the slide quickly, and capable of holding the slide and its attachments at any point in its travel? (b)(2)

Machines Using Full Revolution Positive Clutches. (b)(3)

Do machines using full revolution clutches incorporate a single-stroke mechanism? (b)(3)(i)

If the single-stroke mechanism is dependent upon spring action, are the springs made of a compression type? (b)(3)(ii)

Do such springs operate on a rod or are they guided within a hole or tube, and are they designed to prevent interleaving of the spring coils in event of breakage? (b)(3)(ii)

Foot Pedals (treadle). (b)(4)

Are all pedal mechanisms protected to prevent unintended operation from falling or moving objects or by accidentally stepping onto the pedal? (b)(4)(i)

Is a pad with a nonslip contact area firmly attached to the pedal? (b)(4)(ii)

Are the pedal return springs of the compression type and do they operate on a rod, or are they guided within a hole or tube or otherwise designed to prevent interleaving of spring coils in event of breakage? (b)(4)(iii)

If pedal counterweights are provided, is the path of travel of the weight enclosed? (b)(4)(iv)

1910.217 – MECHANICAL POWER PRESSES
(b) Mechanical Power Press Guarding and Construction, General.

YES NO

Hand Operated Levers. (b)(5)

Are all hand-lever-operated power presses equipped with a spring latch on the operating lever to prevent premature or accidental tripping? (b)(5)(i)

On hand-tripped presses having more than one operating station are the operating levers interlocked to prevent the tripping of the press except by the "concurrent" use of all levers? (b)(5)(ii)

Two-Hand Trip. (b)(6)

Does a two-hand trip have the individual operator's hand controls protected against unintentional operation? (b)(6)(i)

Does the two-hand trip have the individual operator's hand controls so arranged by design and construction and/or separation to require the use of both hands to trip the press? (b)(6)(i)

Does such two-hand trip have a control arrangement requiring concurrent operation of the individual operator's hand controls? (b)(6)(i)

On full revolution clutch machines, does the two-hand trip system incorporate an antirepeat feature? (b)(6)(ii)

On multiple operator presses equipped with two-hand trip systems, is each operator required to have a separate set of controls? (b)(6)(iii)

Machines Using Part Revolution Clutches. (b)(7)

Does the clutch release and the brake set when the external clutch engaging means is removed, deactivated, or deenergized? (b)(7)(i)

Is a red colored stop control provided with the clutch/brake control system? (b)(7)(ii)

Does a momentary operation of the stop control immediately deactivate the clutch and apply the brake? (b)(7)(ii)

Does the stop control override any other control, and does the reactuation of the clutch require use of the operating means which has been selected? (b)(7)(ii)

Is a means of selecting Off, "Inch", Single Stroke, and Continuous, supplied with the clutch/brake control to select the type of operation of the press? (b)(7)(iii)

Is the fixing of the selection of the above controls by a means capable of supervision by the employer? (b)(7)(iii)

Is the "Inch" operating means so designed to prevent the exposure of the workers hands within the point of operation by:

(a) Requiring the concurrent use of both hands to actuate the clutch, or
(b) Being a single control protected against accidental actuation, and so located that the worker cannot reach into the point of operation while operating the single control? (b)(7)(iv)

Do two-hand controls for single stroke conform to the following requirements:

(a) Is each hand control protected against unintended operation and arranged by design, construction, and/or separation so that the concurrent use of both hands is required to trip the press?

1910.217 – MECHANICAL POWER PRESSES
(b) Mechanical Power Press Guarding and Construction, General.

	YES	NO
(b) Is the control system so designed to permit an adjustment which will require concurrent pressure from both hands during the die closing portion of the stroke?		
(c) Does the control system incorporate an antirepeat feature?		
(d) Is the control system designed to require release of all operators' hand controls before an interrupted stroke can be resumed? (b)(7)(v)		
Are controls for more than one operating station that are designed to be activated and deactivated in complete sets of two operator's hand controls per operating station, capable of being supervised by the employer? (b)(7)(vii)		
Is the clutch/brake control system designed and constructed to prevent actuation of the clutch if all operating stations are bypassed? (b)(7)(vii)		
Are those clutch/brake control systems which contain both single and continuous functions designed so that the completion of continuous circuits may be supervised by the employer? (b)(7)(viii)		
Does the initiation of a continuous run require a prior action or decision by the operator, in addition to the selection of Continuous on the stroking selector, before actuation of the operating means will result in a continuous stroking? (b)(7)(viii)		
If a foot control is provided, is the selection method between hand and foot control separate from the stroking selector, and is it designed so that the selection may be supervised by the employer? (b)(7)(ix)		
If foot operated tripping controls are used, are they protected so as to prevent operation from falling or moving objects, or from unintended operation by accidental stepping onto the foot control? (b)(7)(x)		
Is the control of air-clutch machines designed to prevent a significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation if such failure does occur? (b)(7)(xi) NOTE: This requirement applies only to those clutch/brake air-valve controls manufactured and installed on or after August 31, 1971. This **does not** apply to machines intended only for continuous, automatic feeding applications.		
Does the clutch/brake control incorporate an automatic means to prevent initiation or continued activation of the Single Stroke or Continuous functions, unless the press drive motor is energized and in the forward direction? (b)(7)(xii)		
Does the clutch-brake control automatically deactivate in the event of failure of the power or pressure supply for the clutch engaging means? (b)(7)(xiii)		
Does the reactivation of the clutch require restoration of normal supply and the use of tripping mechanisms? (b)(7)(xiii)		
Does the clutch/brake control automatically deactivate in the event of failure of the counterbalances air supply? (b)(7)(xiv)		
Does the reactivation of the clutch require restoration of normal air supply and use of the tripping mechanisms? (b)(7)(xiv)		

1910.217 – MECHANICAL POWER PRESSES
(b) Mechanical Power Press Guarding and Construction, General.

	YES	NO
Is the selection of bar operations by means capable of being supervised by the employer? (b)(7)(xv)		
Is a separate pushbutton employed to activate the clutch, and is the clutch activated only if the driver motor is deenergized? (b)(7)(xv)		
Electrical. (b)(8)		
Is a main power disconnect switch capable of being locked only in the Off position provided with every power press control system? (b)(8)(i)		
Is the motor start button protected against accidental operation? (b)(8)(ii)		
Do mechanical power press controls incorporate a type of drive motor starter that will disconnect the drive motor from the power source in the event of control voltage or power source failure? (b)(8)(iii)		
Do all mechanical power press controls require operation of the motor start button to restart the motor when voltage conditions are restored to normal? (b)(8)(iii)		
● Are all a.c. control circuits and solenoid valve coils powered by not more than a nominal 120-volt a.c. supply from a transformer with an isolated secondary? (b)(8)(iv)		
Where higher voltage is necessary for operation of machine or control mechanisms, are they isolated from any control mechanism handled by the operator, except that motor starters with integral Start-Stop buttons may utilize line voltage control? (b)(8)(iv)		
Are all d.c. control circuits powered by not more than a nominal 120-volt a.c. supply isolated from any higher voltages? (b)(8)(iv)		
Are all clutch/brake control electrical circuits protected against the possibility of an accidental ground in the control circuit causing false operation of the press? (b)(8)(v)		
Do all electrical clutch/brake control circuits incorporate features to minimize the possibility of an unintended stroke in the event of the failure of a control component to function properly, including relays, limit switches, and static output circuits? (b)(8)(vi)		
Slide Counterbalance Systems. (b)(9)		
Do spring counterbalance systems incorporate means to retain system parts in event of breakage? (b)(9)(i)		
Are all spring counterbalances capable of holding the slide and its attachments at midstroke, without brake applied? (b)(9)(ii)		
Do all air counterbalance cylinders incorporate a means to retain the piston and rod in case of breakage or loosening? (b)(9)(iii)		
Are all air counterbalance cylinders capable of holding the slide and its attachments at any point in stroke, without brake applied? (b)(9)(iv)		
Do all air counterbalance cylinders incorporate means to prevent failure of capability in event of air supply failure? (b)(9)(v)		

(b) Mechanical Power Press Guarding and Construction, General.

YES NO

Air Controlling Equipment. **(b)(10)**

Is all air controlling equipment protected against foreign material and water entering the pneumatic system of the press? **(b)(10)**

Is a means of air lubrication provided when needed? **(b)(10)**

Hydraulic Equipment. **(b)(11)**

Are precautions taken to insure that the maximum anticipated working pressures in any hydraulic system on a mechanical power press will not exceed the safe working pressure rating of any component used in that system? **(b)(11)**

Pressure Vessels. **(b)(12)**

Do all pressure vessels used in conjunction with power presses conform to the American Society of Mechanical Engineers Code for Pressure Vessels, 1968? **(b)(12)**

When required by (c)(5) of this checklist, is the control system constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required, but does prevent the initiation of a successive stroke until the failure is corrected?
Is the control system so designed that the failure is detectable by a simple test or as indicated by the control system? **(b)(13)**

When required by (c)(5) of this checklist do all brake monitors meet the following requirements? **(b)(14)**

Are they so constructed so as to automatically prevent the activation of a successive stroke if the stopping time or braking distance deteriorates to a point where the safety distance being utilized does not meet the requirements of (c)(3)(iii)(e) or (c)(3)(vii)(c) below? **(b)(14)(i)**

Is the brake monitor used with a Type B gate or movable barrier device installed in a manner to detect slide top-stop overrun beyond the normal limit established by the employer? **(b)(14)(i)**

Are such devices installed in such a manner that will indicate that the performance of the braking system has deteriorated to the extent described in (b)(14)(i) above? **(b)(14)(ii)**

Are such devices constructed and installed in a manner to monitor brake system performance on each stroke? **(b)(14)(iii)**

(c) Safeguarding the Point of Operation.

General Requirements. **(c)(1)**

Has the employer provided and has he insured the usage of "point of operation guards" or properly applied and adjusted point of operation devices on every operation performed on a mechanical power press? **(c)(1)(i)**

NOTE: For more information see Table O-10. (See Appendix.)

If the point of operation opening is one-fourth inch or less, the requirements as in (i) above are not applicable. **(c)(1)(ii)**

(c) Safeguarding the Point of Operation.

YES NO

Point of Operation Guards. **(c)(2)**

Does every point of operation guard meet the following design, construction, application, and adjustment requirements?

(a) Does it prevent entry of the hands or fingers into the point of operation by reaching through, over, under or around the guard;
(b) Does it conform to the maximum permissible openings of Table O-10; (See Appendix.)
(c) Does it create no pinch point between the guard and moving machine parts;
(d) Does it utilize fasteners not readily removable by the operator;
(e) Does it facilitate its inspection, and
(f) Does it offer maximum visibility of the point of operation consistent with the other requirements? **(c)(2)(i)**

Is a die enclosure guard attached to the die shoe or stripper in a fixed position? **(c)(2)(ii)**

Are all fixed barrier guards attached securely to the frame of the press or to the bolster plate? **(c)(2)(iii)**

Are all interlocked press barrier guards attached to the press frame or bolster? **(c)(2)(iv)**

Are all interlocked press barrier guards interlocked with the press clutch control so that the clutch cannot be activated unless the guard itself, or the hinged or movable sections of the guard are in position? **(c)(2)(iv)**

Are hinged or movable sections of an interlocked press barrier guard prohibited from being used for manual feeding? **(c)(2)(v)**

Does the guard prevent opening of the interlocking section and reaching into the point of operation prior to die closure or prior to the cessation of the slide motion? **(c)(2)(v)**

NOTE: See (c)(3)(ii) for manual feeding through interlocked press barrier devices.

Are all adjustable barrier guards securely attached to the press bed, bolster plate, or die shoe? **(c)(2)(vi)**

Are all adjustable barrier guards adjusted and operated in conformity with Table O-10? (See Appendix.) **(c)(2)(vi)**

Are all adjustments made only by authorized personnel whose qualifications include a knowledge of the provisions of Table O-10? (See Appendix.) **(c)(2)(vi)**

Are all point of operation enclosures which do not meet the requirements of this subparagraph and Table O-10 (see Appendix) used only in conjunction with point of operation devices? **(c)(2)(vii)**

Point of Operation Devices. **(c)(3)**

Do point of operation devices protect the operator by one of the following:

(a) By preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation;
(b) By preventing the operator from inadvertently reaching into the point of operation, or withdrawing his hands if they are inadvertently located in the point of operation as the dies close;

YES NO

(c) By preventing the operator from inadvertently reaching into the point of operation at all times;
(d) Revoked;
(e) By requiring the application of both of the operator's hands to operating controls and locating such controls at a safe distance from the point of operation so that the slide completes the downward travel or stops before the operator can reach into the point of operation with his hands; or
(f) By enclosing the point of operation before a press stroke can be initiated and by maintaining this closed condition until slide motion has ceased;
(g) By enclosing the point of operation before a press stroke can be initiated so as to prevent an operator from reaching into the point of operation prior to die closure or prior to cessation of slide motion in the downward stroke? (c)(3)(i)

Does the gate or movable barrier device protect the operator as follows?

(a) Type A gate or movable barrier protects the operator as indicated in (c)(3)(i)(f) above;
(b) Type B gate or movable barrier device protects the operator as indicated in (c)(3)(i)(g) above? (c)(3)(ii)

Do presence sensing point of operation devices protect the operator as provided in (c)(3)(i)(a) above?
Are presence sensing devices interlocked into the control circuit to prevent or stop the slide motion if any part of the operator's body is within the sensing field during the downward stroke?

(a) Are such devices prohibited on machines using full revolution clutches?
(b) Are such devices prohibited from being used to initiate slide motion?
(c) Is the device so constructed so that a failure within the system does not prevent the normal stopping action from being applied to the press when required?
Is it so constructed that the device will prevent the initiation of a successive stroke until the failure is corrected?
Is the failure indicated by the system?
(d) NOTE: Bypassing of the protective function of the device is permitted on the upstroke of the press for parts ejection, circuit checking and feeding.
(e) Is the safety distance (Ds) from the sensing field to the point of operation exceeding the distance as determined in the following formula?

$$Ds = 63 \text{ inches/second} \times Ts$$

Ds = minimum safety distance (inches); 63 inches/second = hand speed constant.
Ts = stopping time of press measured at approximately 90° position of crankshaft rotation (seconds).

(f) Are guards used to protect all areas of entry to the point of operation not protected by the presence sensing device? (c)(3)(iii)

YES NO

Do pull-out devices protect the operator as specified in (c)(3)(i)(b) above? (c)(3)(iv)

Do pull-out devices include attachments for each of the operator's hands? (c)(3)(iv)

(a) Are such attachments connected to and operated only by the press slide or upper die?
(b) Are such devices adjusted to prevent the operator from reaching into the point of operation or to withdraw the operator's hands from the point of operation before the dies close?
(c) If more than one operator is required on a press, is a separate pull-out device provided for each operator?
(d) Is each pull-out device visually inspected and checked for proper adjustment at the start of each operator shift? (c)(3)(iv)

Do holdout or restraint devices protect the operator as specified in item (c)(3)(i)(c) above? (c)(3)(vi)

Do such devices include attachments for each of the operator's hands? (c)(3)(vi)

Are such attachments securely anchored and adjusted in such a way that the operator is restrained from reaching into the point of operation? (c)(3)(vi)

Is a separate set of restraints provided for each operator, if more than one operator is required on a press? (c)(3)(vi)

Do two-hand control devices protect the operator as specified in subdivision (c)(3)(i)(e) above? (c)(3)(vii)

Where more than one operator is required, are separate two-hand controls provided? (c)(3)(vii)

(a) Are the separate two-hand controls designed to require concurrent application of all operators' controls to activate the slide?
Does the removal of a hand from any control cause the slide to stop?
(b) Does each two-hand control meet the construction requirements of paragraph (b)(7)(v) above?

(c) Safeguarding the Point of Operation.

YES NO

(c) Is the safety distance (Ds) between each two-hand control and the point of operation greater than the distance determined by the following formula?

Ds = 63 inches/second x Ts where;
Ds = minimum safety distance (inches);
63 inches/second = hand speed constant; and
Ts = stopping time of the press measured at approximately 90° position of crankshaft rotation (seconds).

(d) Are two-hand controls fixed in a position so that only a supervisor or safety engineer is capable of relocating them? (c)(3)(vii)

Do two-hand trip devices protect the operator as specified in (c)(3)(i)(e) above? (c)(3)(viii)

(a) Where press operations require more than one operator, are separate two-hand trips provided for each operator? Are they designed to require concurrent application of all operators to activate the slide?

(b) Does each two-hand trip meet the construction requirements of paragraph (b)(6) of this section?

(c) Is the safety distance (Dm) between the two-hand trip and the point of operation greater than the distance determined by the following formula?

Dm = 63 inches/second x Tm; where;
Dm = minimum safety distance (inches);
63 inches/second = hand speed constant; and
Tm = the maximum time the press takes for the die closure after it has been tripped (seconds). For full revolution clutch presses with only one engaging point Tm is equal to the time necessary for one and one-half revolutions of the crankshaft. For full revolution clutch presses with more than one engaging point, Tm shall be calculated as follows:

$$Tm = \left\{ \frac{1}{2} + \frac{1}{\text{No. of engaging pts per revolution}} \right\} \times \text{time necessary to complete one revolution of the crankshaft (seconds).}$$

(d) Are two-hand trips fixed in a position that only a supervisor or safety engineer is capable of relocating them? (c)(3)(viii)

Hand Feeding Tools. (c)(4)

Are hand feeding tools prohibited from being used as a point of operation or a protection device? (c)(4)

Where the operator feeds or removes parts by placing one or both hands in the point of operation, and a two-hand control, presence sensing device of Type B gate or movable barrier is used for safeguarding, are the following requirements met?

(i) Is a control system and brake monitor complying with (b)(13) and (14) in use?
NOTE: Effective as of November 1, 1975.
(ii) Is the control of air clutch machines designed to prevent significant increase in the normal stopping time due to a failure within the operating valve mechanism, and to inhibit further operation? (c)(5)

YES NO

(d) Design, Construction, Setting, and Feeding of Dies.

General Requirements. (d)(1)

Are dies and operating methods designed to control or eliminate hazards to operating personnel (effective February 1, 1975)? (d)(1)(i)

Are hand tools for freeing and removing stuck work or scrap pieces from the die provided so that no employee need reach into the point of operation (Effective February 1, 1975)? (d)(1)(ii)

Scrap Handling. (d)(3)

Have provisions been made for handling scrap from roll feed or random length stock operations? (d)(3)

Are scrap cutters used in conjunction with scrap handling systems safeguarded in accordance with 1910.217(c) and with the requirements of 1910.219 which follow in normal sequence? (d)(3)

Guide Post Hazard. (d)(4)

Is the hazard created by a guide post, when it is located in the immediate vicinity of the operator and when it is separated from its bushings by more than one-fourth inch, protected in accordance with 1910.217(c) of this checklist? (d)(4)

Unitized Tooling. (d)(5)

If unitized tooling is used, is the opening between the top of the punch holder and the face of the slide, or striking pad, safeguarded in accordance with the requirements of 1910.217(c) of this checklist? (d)(5)

Tonnage, Stroke, and Weight Designation. (d)(6)

Are all dies:

(i) Stamped with the tonnage and stroke requirements, or have these characteristics been recorded if these records are readily available to the die setter?
(ii) Stamped to indicate upper die weight when necessary for air counterbalance pressure adjustment?
(iii) Stamped to indicate complete die weight when handling equipment may become overloaded? (d)(6)

Die Fastening. (d)(7)

Are provisions made in both the upper and lower shoes for securely mounting the die to the bolster and slide? (d)(7)

Where clamp caps or setscrews are used in conjunction with punch stems, are additional means of securing the upper shoe to the slide used? (d)(7)

Die Handling. (d)(8)

Are all dies requiring mechanical handling equipped with handling equipment attachments? (d)(8)

Diesetting. (d)(9)

Has a diesetting procedure been established that will insure compliance with the items under 1910.217(c) of this checklist? (d)(9)(i)

Have spring loaded turnover bars been provided for presses designed to accept such turnover bars? (d)(9)(ii)

Have die stops or other means been provided to prevent losing control of the die while setting or removing dies in presses which are inclined? (d)(9)(iii)

1910.217 – MECHANICAL POWER PRESSES

(d) Design, Construction, Setting, and Feeding of Dies.

YES NO

Have safety blocks been provided and required to be used whenever dies are being adjusted or repaired in the press? (d)(9)(iv)

Are brushes, swabs, lubricating rolls and automatic or manual pressure guns provided, so that operators and diesetters will not be required to reach into the point of operation or other hazard areas to lubricate material, punches or dies? (d)(9)(v)

(e) Inspection, Maintenance, and Modification of Presses.

Inspection and Maintenance Records. (e)(1)

Has a program of regular and periodic inspections been established on all power presses to insure that all of their parts, auxiliary equipment, and safeguards are in a safe operating condition and adjustment? (e)(1)(i)

Are records maintained of these inspections and maintenance work performed? (e)(1)(i)

Is each press inspected and tested at least weekly? (e)(1)(ii)

Is necessary maintenance and repair performed and completed before the press is operated? (e)(1)(ii)

Are records kept of these inspections and the maintenance work performed? (e)(1)(ii)

NOTE: This **does not** apply to presses meeting the requirements of (b)(13) and (14).

Modification. (e)(2)

Where power presses have been modified, has the person making the modification furnished instructions to establish new or changed guidelines for use and care of the press? (e)(2)

Work Area. (e)(3)

Have procedures been established whereby the original and continuing competence of personnel caring for, inspecting, and maintaining power presses is insured? (e)(3)

(f) Operation of Power Presses.

Instruction to Operators. (f)(2)

Have operators been trained and instructed in the safe method of work before starting work on any operation covered by this section? (f)(2)

Is adequate supervision available that can correct operating procedures and insure that correct operating procedures are being followed? (f)(2)

Work Area. (f)(3)

Is sufficient clearance available between machines so that movement of one operator will not interfere with the work of another? (f)(3)

Is ample room for cleaning machines, handling material, work pieces, and scrap also provided? (f)(3)

Are surrounding floors kept in good condition and free from obstructions, grease, oil, and water? (f)(3)

1910.217 – MECHANICAL POWER PRESSES

(f) Operation of Power Presses.

YES NO

Overloading. (f)(4)

Are presses operated within the tonnage and attachment weight ratings specified by the manufacturer? (f)(4)

(g) Reports of Injuries to Employees Operating Mechanical Power Presses.

Are procedures established so that all point of operation injuries are reported to the Office of Standards Development, OSHA, Washington, D.C. 20210 or to the State Agency administering a plan under the OSHAct within 30 days of such injury? (g)

Is the following information provided on each report?

(i) Employer's name, address and location of the workplace (establishment).

(ii) Employee's name, injury sustained, and the task being performed (operation, set-up, maintenance, or other).

(iii) Type of clutch used on the press (full revolution, part revolution, or direct drive).

(iv) Type of safeguard(s) being used (two hand control, two hand trip, pullouts, sweeps, or other). If the safeguard is not described in this section, give a complete description.

(v) Cause of the accident (repeat of press, safeguard failure, removing stuck part or scrap, no safeguard provided, no safeguard in use, or other).

(vi) Type of feeding (manual with hands in dies or with hands out of dies, semi-automatic, automatic, or other).

(vii) Means used to actuate press stroke (foot trip, foot control, hand trip, hand control, or other).

(viii) Number of operators required for the operation and the number of operators provided with controls and safeguards. (g)

1910.218 – FORGING MACHINES

(a) General Requirements.

Use of Lead. (a)(1)

Are the following safety requirements followed when lead casts or other use of lead is involved in the forge shop or die shop:

(i) Are thermostatic controls of heating elements provided to maintain proper melting temperature and prevent overheating?

(ii) Are all fixed or permanent lead pot installations exhausted?

(iii) Are portable units used only in areas where good, general room ventilation is provided?

(iv) Is personal protective equipment, such as gloves, goggles, aprons, and other items worn?

(v) Is a covered container provided to store dross skimmings?

(vi) Is equipment kept clean, particularly from accumulations of yellow lead oxide? (a)(1)

1910.218 – FORGING MACHINES

(a) General Requirements.

YES NO

Inspection and Maintenance. (a)(2)

Is all forge shop equipment maintained in a condition which will insure continued safe operation? (a)(2)

Does this responsibility include:

(i) The establishment of periodic and regular maintenance safety checks and the keeping of records of these inspections?

(ii) A scheduling and recording inspection of guards and point of operation protection devices at frequent and regular intervals?

(iii) The training of personnel for the proper inspection and maintenance of forging machinery and equipment?

(iv) To insure that all overhead parts are fastened or protected in such a manner that they will not fly off or fall in the event of failure? (a)(2)

Hammers and Presses. (a)(3)

Are all hammers positioned or installed in such a manner that they remain on or are anchored to foundations sufficient to support them according to applicable engineering standards? (a)(3)(i)

Are all presses installed in such a manner that they remain where they are positioned, or they are anchored to foundations sufficient to support them according to applicable engineering standards? (a)(3)(ii)

Are provisions made for disconnecting the power to the machine and for locking out or rendering cycling controls inoperable? (a)(3)(iii)

Is the ram blocked when dies are being changed or other work is being done on the hammer? (a)(3)(iv)

Are blocks or wedges made of material the strength and construction of which meets or exceeds the specifications and dimensions shown in Table O-11? (See Appendix.) (a)(3)(iv)

Are tongs of sufficient length to clear the body of the worker in case of kickback? (a)(3)(v)

Are tongs prohibited from having sharp handle ends? (a)(3)(v)

Are oil swabs, or scale removers, or other devices to remove scale provided? (a)(3)(vi)

Are the above devices sufficiently long to enable a man to reach the full length of the die without placing his hand or arm between the dies? (a)(3)(vi)

Is material handling equipment of adequate strength, size, and dimension to handle diesetting operations safely? (a)(3)(vii)

Is a scale guard of substantial construction provided at the back of every hammer, so arranged as to stop flying scale? (a)(3)(viii)

1910.218 – FORGING MACHINES

(a) General Requirements.

YES NO

Is a scale guard of substantial construction provided at the back of every press, so arranged as to stop flying scale? (a)(3)(ix)

(b) Hammers, General.

Keys. (b)(1)

Are die keys and shims made from a grade of material that will not unduly crack or splinter? (b)(1)

Foot Operated Devices. (b)(2)

Are all foot operated devices substantially and effectively protected from unintended operation? (b)(2)

(c) Presses.

Are all manually operated valves and switches clearly identified and readily accessible? (c)

(d) Power-Driven Hammers.

Safety Cylinder Head. (d)(1)

Does every steam or airhammer have a safety cylinder head to act as a cushion if the rod should break or pull out of the ram? (d)(1)

Shutoff Valve. (d)(2)

Are steam hammers provided with a quick closing emergency valve in the admission pipeline at a convenient location? (d)(2)

Is such valve closed and locked in the off position while the hammer is being adjusted, repaired, or serviced, or when the dies are being changed? (d)(2)

Cylinder Draining. (d)(3)

Are steam hammers provided with a means of cylinder draining, such as a self-draining arrangement or a quick-acting drain cock? (d)(3)

Pressure Pipes. (d)(4)

Does steam or air piping conform to the specifications of ANSI Standard B31.1.0-1967, with the Addenda issued before April 28, 1971? (d)(4)

(e) Gravity Hammers.

Air-Lift Hammers. (e)(1)

Are air-lift hammers provided with a safety cylinder head as required in item (d)(1) above? (e)(1)(i)

Are air-lift hammers provided with an air shutoff valve as required in item (d)(2) above? (e)(1)(ii)

Are air-lift hammers provided with two drain cocks: one on main head cylinder, and one on clamp cylinder? (e)(1)(iii)

Does air piping conform to the specifications of ANSI Standard B31.1.0-1967, with the Addenda issued before April 28, 1971? (e)(1)(iv)

YES NO

1910.218 – FORGING MACHINES

(e) Gravity Hammers.

Board Drophammers. (e)(2)

Is a suitable enclosure provided to prevent damaged or detached boards from falling? (e)(2)(i)

Is the board enclosure securely fastened to the hammer? (e)(2)(i)

Are all major assemblies and fittings which can loosen and fall, properly secured in place? (e)(2)(ii)

(f) Forging Presses.

Mechanical Forging Presses. (f)(1)

When dies are being changed or maintenance is being performed on the press, are the following items complied with:

(i) Is the power to the press locked out?
(ii) Is the flywheel at rest?
(iii) Is the ram blocked with material the strength of which meets or exceeds the specifications or dimensions shown in Table 0-11? (See Appendix.) (f)(1)

Hydraulic Forging Presses. (f)(2)

When dies are being changed or maintenance is being performed on the presses, are the following items complied with:

(i) Are the hydraulic pumps and power apparatus locked out?
(ii) Is the ram blocked with a material the strength of which meets or exceeds the specifications or dimensions shown in Table 0-11? (See Appendix.) (f)(2)

(g) Trimming Presses.

Hot Trimming Presses. (g)(1)

Do hot trimming presses comply with the items under 1910.218(f)(1) above? (g)(1)

Cold Trimming Presses. (g)(2)

Are cold trimming presses safeguarded in accordance with 1910.217(c), which is reproduced for you at this time:

(c) Safeguarding the Point of Operation.

1910.217(c)(1) – General Requirements.
(c)(1)(i): Has the employer provided and has he insured the usage of "point of operation guards" or properly applied and adjusted point of operation devices on every operation performed on a mechanical power press? (g)(2)
NOTE: For more information see Table 0-10. (See Appendix.)
(c)(1)(ii): If the point of operation opening is one-fourth inch or less, the requirements as in (i) above are not applicable. (g)(2)
1910.217(c)(2) – Point of Operation Guards.
(c)(2)(i): Does every point of operation guard meet the following design, construction, application and adjustment requirements?
(a) Does it prevent entry of the hands or fingers into the point of operation by reaching through, over, under or around the guard;
(b) Does it conform to the maximum permissible openings of Table 0-10? (See Appendix.)
(c) Does it create no pinch point between the guard and moving machine parts;
(d) Does it utilize fasteners not readily removable by the operator?

YES NO

1910.218 – FORGING MACHINES

(g) Trimming Presses.

(e) Does it facilitate its inspection; and
(f) Does it offer maximum visibility of the point of operation consistent with the other requirements? (g)(2)
(c)(2)(ii): Is a die enclosure guard attached to the die shoe or stripper in a fixed position? (g)(2)
(c)(2)(iii): Are all fixed barrier guards attached securely to the frame of the press or to the bolster plate? (g)(2)
(c)(2)(iv): Are all interlocked press barrier guards attached to the press frame or bolster?
Are all interlocked press barrier guards interlocked with the press clutch control so that the clutch cannot be activated unless the guard itself, or the hinged or movable sections of the guard are in position? (g)(2)
(c)(2)(v): On full revolution clutches, are interlocked press barrier guards used only on the single stroke? (g)(2)
(c)(2)(vi): Are all adjustable barrier guards securely attached to the press bed, bolster plate, or die shoe?
Are all adjustments made only by authorized personnel whose qualifications include a knowledge of the provisions of Table 0-10? (See Appendix.) (g)(2)
(c)(2)(vii): Are all point of operation enclosures which do not meet the requirements of this subparagraph and Table 0-10 (see Appendix) used only in conjunction with point of operation devices? (g)(2)
1910.217(c)(3) – Point of Operation Devices.
(c)(3)(i): Do point of operation devices protect the operator by one of the following:
(a) By preventing and/or stopping normal stroking of the press if the operator's hands are inadvertently placed in the point of operation;
(b) By preventing the operator from inadvertently reaching into the point of operation, or withdrawing his hands if they are inadvertently located in the point of operation as the dies close;
(c) By preventing the operator from inadvertently reaching into the point of operation at all times;
(d) By requiring application of both of the operator's hands to machine operating controls during the die closing portion of the press stroke;
(e) By locating single cycle operating controls so that the slide completes its downward travel before the operator's hands can inadvertently reach into the point of operation? (g)(2)

(c)(3)(ii): Do all gate or movable barrier devices protect the operator in accordance with the items above, and do they enclose the point of operation before the press clutch can be actuated?
(a) When gate or movable barrier devices are used with a power press having a full revolution clutch, does the device operate with a single-stroke mechanism?
Is such applied so as to make impossible any attempt, after tripping the clutch, to open the device and reach into the point of operation prior to die closure?
(b) When a gate or movable barrier device is used with a part revolution clutch, is the device interlocked into the clutch/brake control system to prevent or stop activation of the clutch unless the device is in its closed position? (g)(2)

(c)(3)(iii): Do the presence sensing point of operation devices protect the operator as required in the items under (i)(a) above?

YES NO

Are presence sensing point of operation devices interlocked into the clutch/brake control circuit to prevent or stop clutch activation and apply the brake if an operator's hand or other part of his body is detected in the sensing field of the device?

(a) Are presence sensing point of operation devices installed so as not to create any hazard to the operator?

(b) Are presence sensing point of operation devices prohibited from being used on machines using full revolution clutches?

(c) Are presence sensing point of operation devices prohibited from being used as a tripping mechanism?

(d) Are presence sensing point of operation devices designed for failsafe operation? (g)(2)

(c)(3)(iv): Do pull-out devices protect the operator as specified in (3)(i)(b) above?

Do pull-out devices include attachments for each of the operator's hands?

Are such attachments connected to and operated only by the press slide or upper die?

Are such devices adjusted to prevent the operator from reaching into the point of operation or to withdraw the operator's hands from the point of operation before the dies close?

If more than one operator is required on a press, is a separate pull-out device provided for each operator? (g)(2)

(c)(3)(v): Do sweep devices protect the operator as specified in (3)(i)(b) above?

Do sweep devices have a barrier attached to the sweep arm in such a manner as to prevent the operator from reaching into the point of operation past the trailing edge of the sweep arm on the downward stroke of the press?

(a) Is the sweep device activated by the slide or by motion of a foot pedal triprod?

(b) Is the sweep device so designed, installed and operated as to prevent the operator from reaching into the point of operation before the dies close?

(c) Is the sweep device installed so that it will not itself create an impact or shear hazard between the sweep arm and the press tie rods, dies, or any other part of the press or barrier?

(d) Are partial enclosures conforming with this subparagraph provided on both sides of the point of operation to prevent the operator from reaching around or behind the sweep device and into the point of operation after the dies start to close?

Are precautions taken to insure that side partial enclosures will not themselves create a pinch point or shear hazard? (g)(2)

(c)(3)(vi): Do holdout or restraint devices protect the operator as specified in item (3)(i)(c) above?

Do such devices include attachments for each of the operator's hands?

Are such attachments securely anchored and adjusted in such a way that the operator is restrained from reaching into the point of operation?

Is a separate set of restraints provided for each operator, if more than one operator is required on a press? (g)(2)

(c)(3)(vii): Do two-hand control devices protect the operator as specified in subdivision (3)(i)(d) above?

Where more than one operator is required, are separate two-hand controls provided? (g)(2)

YES NO

(c)(3)(viii): Do two-hand trip devices protect the operator as specified in (3)(i)(e) above?

When a two-hand trip is sued as a point of operation device, does it meet the construction requirements of paragraph (b)(6) of this checklist, the items of which are reproduced at this time?

> "Does a two-hand trip have the individual operator's hand controls protected against unintentional operation?
>
> Does the two-hand trip have the individual operator's hand controls so arranged by design and construction and/or separation to require the use of both hands to trip the press?
>
> Does such two-hand trip have a control arrangement requiring concurrent operation of the individual operator's hand controls?
>
> On full revolution clutch machines, does the two-hand trip system incorporate an antirepeat feature?
>
> On multiple operator presses equipped with two-hand trip systems, is each operator required to have a separate set of controls?" (g)(2)

(c)(3)(ix): Are two-hand tripping devices used with full revolution clutches considered as a point of operation device only when installed on presses of high speed, short stroke, or by having these control mechanisms mounted at a distance away from the point of operation? (g)(2)

1910.217(c)(4) – Hand Feeding Tools.

Are hand feeding tools prohibited from being used as a point of operation or a protection device? (g)(2)

(h) Upsetters.

General Requirements. (h)(1)

Are all upsetters installed so that they remain on their supporting foundations? (h)(1)

Lockouts. (h)(2)

Are upsetters provided with a means for locking out the power at its entry point to the machine and rendering its cycling controls inoperable? (h)(2)

Manually Operated Controls. (h)(3)

Are all manually operated controls, valves, and switches clearly identified and readily accessible? (h)(3)

Tongs. (h)(4)

Are tongs used of sufficient length to clear the body of the worker in case of kickback? (h)(4)

Are tongs prohibited from having sharp handle ends? (h)(4)

Changing Dies. (h)(5)

When dies are being changed, maintenance performed, or any work done on the machine, is the power to the upsetter locked out and the flywheel at rest? (h)(5)

1910.218 – FORGING MACHINES

YES NO

(i) Other Forging Equipment.

Boltheading. (i)(1)

Are the provisions under (h) above in compliance on boltheading? (i)(1)

Rivet Making. (i)(2)

Are the provisions of (h) above in compliance with rivet making? (i)(2)

(j) Other Forge Facility Equipment.

Billet Shears. (j)(1)

Is a positive-type lockout device for disconnecting the power to the shear provided? (j)(1)

Saws. (j)(2)

Is every saw provided with a guard of not less than one-eighth inch sheet metal positioned to stop flying sparks? (j)(2)

Conveyors. (j)(3)

Is conveyor power transmission equipment guarded in accordance with ANSI B20.1-1957? (j)(3)

Shot Blast. (j)(4)

Are cleaning chambers provided with doors or guards to protect operators? (j)(4)

Grinding. (j)(5)

Is personal protective equipment used in grinding operations, and is such equipment used and maintained in accordance with ANSI B7.1-1970, and the items under 1910.215 of this checklist? (j)(5)

1910.219 – MECHANICAL POWER–TRANSMISSION APPARATUS

(a) General Requirements.

This section covers all types and shapes of power-transmission belts, except the following when operating at 250 feet per minute or less: (i) Flat belts 1 inch or less in width, (ii) flat belts 2 inches or less in width which are free from metal lacings or fasteners, (iii) round belts ½ inch or less in diameter; and (iv) single strand V-belts, the width of which is 13/32 inch or less. (a)(1)

Vertical and inclined belts, if not more than 2½ inches wide and running at a speed of less than 1,000 feet per minute, and if free from metal lacings or fastenings may be guarded with a nip-point belt and pulley guard. (a)(2)

1910.219 – MECHANICAL POWER–TRANSMISSION APPARATUS

(a) General Requirements.

YES NO

For the Textile Industry, the sides and face sections only of nip-point belt and pulley guards are required, provided the guard extends at least 6 inches beyond the rim of the pulley on the in-running and off-running sides of the belt, and at least 2 inches away from the rim and face of the pulley in all other directions. (a)(3)

(b) Prime-Mover Guards.

Flywheels. (b)(1)

Are flywheels that are located so that any part is 7 feet or less above a floor or platform guarded in accordance with the requirements of this subparagraph:

(i) Are flywheels enclosed with an enclosure of sheet, perforated, or expanded metal, or woven wire?

(ii) Are flywheels guarded with guard rails placed not less than 15 inches nor more than 20 inches from rim?

When a flywheel extends into a pit or is within 12 inches of a floor, is a standard toeboard also provided?

(iii) When the upper rim of a flywheel protrudes through a working floor, is it entirely enclosed or surrounded by a guardrail and toeboard?

(iv) For flywheels with smooth rims 5 feet or less in diameter, which cannot be provided with guards as mentioned previously, are they equipped as follows:

With a disk attached to the flywheel in such a manner as to cover the spokes of the wheel on the exposed side and present a smooth surface and edge, and at the same time providing means for periodic inspection?

Where a disk is used, are keys or other dangerous projections cut off or covered?

(v) On flywheels of gas or oil engines, is an adjustable guard used for starting the engine or for running adjustments?

(vi) Are guards installed having sufficient strength to hold the weight of the flywheel in the event of a shaft or wheel mounting failure, wherever flywheels are above working areas? (b)(1)

Cranks and Connecting Rods. (b)(2)

When cranks and connecting rods are exposed to contact, are they guarded in accordance with the items under (m) and (n), which follow in normal sequence, or by a guardrail as described in items under paragraph (o) which follow in normal sequence? (b)(2)

Tail Rods or Extension Piston Rods. (b)(3)

Are tail rods or extension piston rods guarded in accordance with the items under paragraphs (m) and (o) of this section, or by a guardrail on sides and end, with a clearance of not less than 15, nor more than 20 inches when rod is fully extended? (b)(3)

YES NO

(c) Shafting.

Installation. (c)(1)

Is each continuous line of shafting secured in position to prohibit excessive endwise movement? (c)(1)(i)

Are inclined and vertical shafts, particularly inclined idler shafts, securely held in position against endwise thrust? (c)(1)(ii)

Guarding Horizontal Shafting. (c)(2)

Are all exposed parts of horizontal shafting 7 feet or less from a floor or working platform protected by a stationary casing enclosing shafting completely, or by a trough enclosing sides and top or sides and bottom of shafting as a location requires? (c)(2)(i)

Exception: Runways used exclusively for oiling, or running adjustments.

Is shafting under bench machines enclosed by a stationary casing, or by a trough at sides and top or sides and bottom, as location requires? (c)(2)(ii)

Do the sides of the trough come within at least 6 inches of the underside of a table, or if shafting is located near a floor, within 6 inches of the floor? (c)(2)(ii)

Do the sides of the trough extend at least 2 inches beyond the shafting or protuberance? (c)(2)(ii)

Guarding Vertical and Inclined Shafting. (c)(3)

Is all vertical and inclined shafting 7 feet or less from floor or working platform enclosed with a stationary casing in accordance with requirements of items under (m) and (o) of this checklist which follow in normal sequence? (c)(3)

Projecting Shaft Ends. (c)(4)

Do projecting shaft ends present a smooth edge and end? (c)(4)(i)

If projecting shaft ends project more than one-half the diameter of the shaft, are the ends guarded by nonrotating caps or safety sleeves? (c)(4)(i)

Are unused keyways filled up or covered? (c)(4)(ii)

Power-Transmission Apparatus Located in Basements. (c)(5)

Is all mechanical power transmission apparatus located in basements, towers, and rooms used exclusively for power transmission equipment guarded in accordance with this section? (c)(5)

Exceptions: Safeguarding of belts, pulleys, and shafting need not be complied with when the following are met.

The basement, tower, or room occupied by transmission equipment is locked against unauthorized entrance. (c)(5)(i)

The vertical clearance in passageways between the floor and power transmission beams, ceiling, or any other objects, is not less than 5 feet, 6 inches. (c)(5)(ii)

The intensity of illumination conforms to the requirements of ANSI-A11.1-1965 (R-1970). (c)(5)(iii)

The route followed by the oiler is protected in such a manner as to prevent accidents. (c)(5)(v)

YES NO

(d) Pulleys.

Guarding. (d)(1)

Are pulleys, any parts of which are 7 feet or less from the floor or working platform, guarded in accordance with the items specified in (m) and (o) of this checklist? (d)(1)

Are pulleys that serve as balance wheels (e.g., punch presses) on which the point of contact between the belt and pulley is more than 6 feet, 6 inches from the floor or platform guarded with a disk covering the spokes? (d)(1)

Location of Pulleys. (d)(2)

If the distance to the nearest fixed pulley, clutch, or hanger exceeds the width of the belt used, is a guide provided to prevent the belt from leaving the pulley on the side where insufficient clearance exists? (d)(2)(i)

Broken Pulleys. (d)(3)

Are precautions taken to insure that pulleys with cracks, or pieces broken out of rims, will not be used? (d)(3)

Pulley Speeds. (d)(4)

Are pulleys that are intended to operate at a rim speed in excess of manufacturers normal recommendations, specially designed and carefully balanced for the speed at which they are to operate? (d)(4)

(e) Belt, Rope, and Chain Drives.

Horizontal Belts and Ropes. (e)(1)

Where both runs of horizontal belts are 7 feet or less from the floor level, do guards extend to at least 15 inches above the belt or to the standard height of 7 feet, whichever is greater? (e)(1)(i)

Where both runs of a horizontal belt are 42 inches or less from the floor, is the belt fully enclosed in accordance with the items under (m) and (o) of this section, which follow in normal sequence? (e)(1)(i)

In powerplants or power development rooms, where a guardrail may be used in lieu of the guard required by subdivision (i) of this subparagraph, are guardrails installed? (e)(1)(ii)

Overhead Horizontal Belts. (e)(2)

On overhead horizontal belts, where the lower part is 7 feet or less from the floor or platform, is it guarded on the sides and bottom in accordance with items under (o)(3) of this checklist, which follows in normal sequence? (e)(2)(i)

On horizontal overhead belts that are more than 7 feet above the floor or platform, are they guarded for their entire length under the following conditions:

(a) If the belts are located over passageways or work places and traveling 1,800 feet or more per minute;

(b) If the center to center distance between pulleys is 10 feet or more;
(c) If the belt is 8 inches or more in width. (e)(2)(ii)

Where the upper and lower runs of horizontal belts are so located that passage of persons between them would be impossible, are one of the following requirements met:

(a) Is the passage completely barred by a guardrail or other barrier in accordance with the items under (m) and (o) of this checklist; or
(b) Where the passage is regarded as necessary, is there a platform over the lower run guarded on either side by a railing completely filled with wire mesh or other filler, or by a solid barrier? (e)(2)(iii)

Is the upper run so guarded as to prevent contact therewith either by the worker or by objects carried by him? (e)(2)(iii)

Are overhead chain and link belt drives guarded in the same manner as belts? (e)(2)(iv)

Vertical and Inclined Belts. (e)(3)

Are vertical and inclined belts enclosed by a guard conforming to the items under (m) and (o) of this checklist, which follow in normal sequence? (e)(3)(i)

Are guards for inclined belts so arranged that a minimum clearance of 7 feet is maintained between the belt and floor at any point outside of the guard? (e)(3)(ii)

Vertical Belts. (e)(4)

Are vertical belts running over a lower pulley more than 7 feet above a floor or platform guarded at the bottom in the same manner as horizontal overhead belts if the following conditions exist:

(a) If they are located over passageways or work places traveling 1,800 feet or more per minute;
(b) If the belt is 8 inches or more in width? (e)(4)

Cone-Pulley Belts. (e)(5)

Is the cone belt and pulley equipped with a belt shifter so constructed as to adequately guard the nip point of the belt and pulley? (e)(5)(i)

If the frame of the belt shifter does not adequately guard the nip point, is it further protected by means of a vertical guard placed in front of the pulley and extending at least to the top of the largest step of the cone? (e)(5)(i)

If the belt is of the endless type or laced with rawhide laces, and a belt shifter is not desired, is the nip point of the belt and pulley protected by a nip point guard located in front of the cone, extending at least to the top of the largest step of the cone, and formed to show the contour of the cone in order to give the nip point of the belt and pulley the maximum protection? (e)(5)(ii)

If the cone is located less than 3 feet from the floor or working platform, is the cone pulley and belt guarded to a height of 3 feet regardless of whether the belt is endless or laced with rawhide? (e)(5)(iii)

Belt Tighteners. (e)(6)

Are all suspended counterbalanced tighteners and all parts thereof, of substantial construction and securely fastened? (e)(6)(i)

Are all bearings securely capped? (e)(6)(i)

Are means provided to prevent tighteners from falling, in case the belt breaks? (e)(6)(i)

Where suspended counterweights are used and are not guarded by location, are they so encased as to prevent accident? (e)(6)(ii)

(f) Gears, Sprockets, and Chains.

Gears. (f)(1)

Are gears guarded in accordance with one of the following methods:

(i) By a complete enclosure; or
(ii) By a standard guard as described in the items under (o) of this checklist that is at least 7 feet high extending 6 inches above the mesh point of the gears; or
(iii) By a band guard covering the face of the gear and having flanges extended inward beyond the root of the teeth on the exposed side or sides. (f)(1)

Where any portion of the train of gears guarded by a band guard is less than 6 feet from the floor, is a disk guard or a complete enclosure to the height of 6 feet provided? (f)(1)

Hand-Operated Gears. (f)(2)

The items under (1) above **do not** apply to hand-operated gears used only to adjust machine parts, and which do not continue to move after hand power is removed. (f)(2)

Sprockets and Chains. (f)(3)

Are all sprocket wheels and chains that are less than 7 feet above the floor or platform enclosed? (f)(3)

Where the drive extends over other machine or working areas, is protection against falling provided? (f)(3)

The above **does not** apply to manually operated sprockets. (f)(3)

Openings for Oiling. (f)(4)

When frequent oiling must be done, are openings with hinged or sliding self-closing covers provided? (f)(4)

Are all points not readily accessible equipped with oil feed tubes if lubricant is to be added while machinery is in motion? (f)(4)

(g) Guarding Friction Drives.

When the driving points of all friction drives are exposed to contact are they guarded? (g)

Are all arm or spoke friction drives and all web friction drives with holes in the web entirely enclosed? (g)

Are all projecting belts on friction drives where exposed to contact, guarded? (g)

(h) Keys, Setscrews, and Other Projections.

Are all projecting keys, setscrews, and other projections in revolving parts removed or made flush or guarded by metal cover? (h)(1)

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(h) Keys, Setscrews, and Other Projections.

YES NO

The above does not apply to keys or setscrews within gear or sprocket casings or other enclosures, nor to keys, setscrews, or oil cups in hubs of pulleys less than 20 inches in diameter where they are within the plane of the rim of the pulley. (h)(1)

(i) Collars and Couplings.

Collars. (i)(1)

Are all revolving collars, including split collars, cylindrical? (i)(1)

Are screws or bolts that are used in collars prohibited from projecting beyond the largest periphery of the collar? (i)(1)

Couplings. (i)(2)

Are shaft couplings so constructed as to present no hazard from bolts, nuts, setscrews, or revolving surfaces? (i)(2)

Where bolts, nuts, and setscrews are essential are they covered with safety sleeves, or where they are used parallel with the shafting are they countersunk, or prohibited from extending beyond the flange of the coupling? (i)(2)

(j) Bearings and Facilities for Oiling.

Are all drip cups and pans securely fastened? (j)

(k) Guarding of Clutches, Cutoff Couplings, and Clutch Pulleys.

Guards. (k)(1)

Are clutches, cutoff couplings, or clutch pulleys having projecting parts, that are located 7 feet or less above the floor or working platform, enclosed by a stationary guard constructed in accordance with the items in this checklist? (k)(1)

Engine Rooms. (k)(2)

In engine rooms occupied only by engine room attendants, is a guardrail with toeboard used instead of the guard required by the item immediately above? (k)(2)

(l) Belt Shifters, Clutches, Shippers, Poles, Perches, and Fasteners.

Belt Shifters. (l)(1)

Are all tight and loose pulleys on all new installations made after August 31, 1971, equipped with a permanent belt shifter provided with mechanical means to prevent the belt from creeping from loose to tight pulley? (l)(1)(i)

Have all old installations been changed to conform to this rule? (l)(1)(i)

Are all belt shifter and clutch handles rounded and are they located as far as possible from the danger of accidental contact, and yet within easy reach of the operator? (l)(1)(ii)

Where belt shifters are not directly located over a machine or bench, are the handles cut off 6 feet, 6 inches above the floor level? (l)(1)(ii)

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(l) Belt Shifters, Clutches, Shippers, Poles, Perches, and Fasteners.

YES NO

Belt Shippers and Shipper Poles. (l)(2)

Use of belt poles as substitutes for mechanical shifters is not recommended. (l)(2)

Belt Perches. (l)(3)

Where loose pulleys or idlers are not practicable, are belt perches in the form of brackets or rollers used to keep idle belts away from the shafts? (l)(3)

Belt Fasteners. (l)(4)

Are belts which of necessity must be shifted by hand, and belts within 7 feet of the floor or working platform which are not guarded in accordance with this section, fastened with metal or with any other fastening which by construction or wear will constitute an accident hazard? (l)(4)

(m) Standard Guards – General Requirements.

Materials. (m)(1)

Are all guards fabricated of the following materials: expanded metal, perforated or solid sheet metal, wire mesh on a frame of angle iron, or iron pipe securely fastened to the floor or to the frame of the machine? (m)(1)(i)

Is all metal free from burrs and sharp edges? (m)(1)(ii)

Methods of Manufacture. (m)(2)

Is expanded metal, sheet or perforated metal, and wire mesh securely fastened to the frame? (m)(2)(i)

(o) Approved Materials.

Minimum Requirements. (o)(1)

With the exception of horizontal overhead belts, rope, cable, or chain guards more than 7 feet above the floor or platform, are all guards made of the materials and dimensions specified in the following items: (o)(1)
(a) Are all guards rigidly braced every 3 feet or fractional part of their height to some fixed part of the machinery or building structure?

Where the guard is exposed to contact with moving equipment, is additional strength designed into it? (o)(1)

Wood Guards. (o)(2)

Are wood guards prohibited from being used in areas other than in the woodworking and chemical industries, in industries where the presence of fumes or where manufacturing conditions would cause the rapid deterioration of metal guards, and in construction work and in locations outdoors where extreme cold or extreme heat make metal guards and railings undesirable? (o)(2)(i)

Guards for Horizontal Overhead Belts. (o)(3)

Do guards for horizontal overhead belts run the entire length of the belt and follow the line of the pulley to the ceiling, or are they carried to the nearest wall? (o)(3)(i)

Where it is impossible to construct the guard as above, is the guard installed and constructed so as to enclose completely the top and bottom runs of the belt and face of the pulleys? (o)(3)(i)

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(o) Approved Materials.

	YES	NO
Is suitable reinforcement provided for the ceiling rafters or overhead floor beams, where such is necessary to safely sustain the weight and stress likely to be imposed by the guard? (o)(3)(iii)		
Is the interior surface of all guards smooth and free from all projections of any character? (o)(3)(iii)		
Are overhead belt guards at least one-quarter wider than the belt itself, and in no case less than 6 inches on each side? (o)(3)(iii)		
Are guards for overhead rope drives and block and roller-chain-drives, at least six (6) inches wider than the drive on each side? (o)(3)(iii)		
On guards for silent chain sprockets with less than 20 inch centers, is the clearance between the guard and the chain at least one-fourth inch? (o)(3)(iii)		
On guards for silent chain drives with sprockets with more than 20 inches on centers, is the clearance between the guard and chain at least one-half inch? (o)(3)(iii)		
Guards for Horizontal Overhead Rope and Chain Drives. (o)(4)		
Do overhead-rope and chain-drive guards comply with the items under (3) above, except that the filler material is of the solid type as shown in Table O-13 (see Appendix), unless a fire hazard demands the use of open construction? (o)(4)		
Guardrails and Toeboards. (o)(5)		
Where guardrails are used are they forty-two (42) inches in height, with a midrail between the top rail and the floor? (o)(5)(i)		
Are posts for guardrails spaced not more than 8 feet apart? (o)(5)(ii)		
Are posts permanent and substantial, smooth, and free from protruding nails, bolts, and splinters? (o)(5)(ii)		
Are posts made of pipe at least 1-¼ inches inside diameter, or larger? (o)(5)(ii)		
If made of metal shapes or bars, is their section equal in strength to that of 1-½ by 1-½ by 3/16-inch angle iron? (o)(5)(ii)		
If posts are made of wood, are they at least 2 x 4 inches or larger? (o)(5)(ii)		
Is the upper rail equal to the strength of a 2 x 4? (o)(5)(ii)		
Is the midrail at least 1 x 4 inches? (o)(5)(ii)		
Are toeboards at least 4 inches or more in height? (o)(5)(iii)		
If made of metal grill, are the openings less than 1" mesh? (o)(5)(iii)		

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	YES	NO
(p) Care of Equipment.		
General. (p)(1)		
Is all power-transmission equipment inspected at intervals not exceeding 60 days, and is it kept in good working condition at all times? (p)(1)		
Shafting. (p)(2)		
Is shafting kept in alignment, free from rust and excess oil or grease? (p)(2)(i)		
Is the hazard of static sparks from shafting carefully considered, where explosives, explosive dusts, flammable vapors or flammable liquids exist? (p)(2)(ii)		
Bearings. (p)(3)		
Are bearings kept in alignment and properly adjusted? (p)(3)		
Hangers. (p)(4)		
Are hangers inspected to make certain that all supporting bolts and screws are tight and that supports of hanger boxes are adjusted properly? (p)(4)		
Pulleys. (p)(5)		
Are pulleys kept in proper alignment to prevent belts from running off? (p)(5)(i)		
Care of Belts. (p)(6)		
Is an inspection made of belts, lacings, and fasteners, and is such equipment kept in good repair? (p)(6)(ii)		
Lubrication. (p)(7)		
Are regular oilers required to wear tight-fitting clothing? (p)(7)		

TABLE 0-1 – Minimum Basic Thickness for Peripheral and Side Members for Safety Guards Used with Cutting-off Wheels

Material used in construction of guard	Maximum thickness of cutting off wheel	Speed not to exceed	Cutting off wheel diameters									
			6 to 11 inches		Over 11 to 20 inches		Over 20 to 30 inches		Over 30 to 48 inches		Over 48 to 72 inches	
			A	B	A	B	A	B	A	B	A	B
Structural steel (min. tensile strength 60,000 p.s.i.)	½ inch or less	14,200 SFPM	1/16	1/16	3/32	3/32	⅛	⅛	3/16	3/16	¼	¼
	½ inch or less	16,000 SFPM	3/32	⅛	⅛	⅛	3/16	⅛	¼	3/16	5/16	¼

TABLE 0-2 – Exposure Versus Wheel Thickness

Overall thickness of wheel (T) (inches)	*Maximum exposure of wheel (C) (inches)*
½	¼
1	½
2	¾
3	1
4	1½
5 and over	2

TABLE 0-3 – Guide for Construction of Band Type Guards (Maximum Wheel Speed 7,000 SFPM)

Minimum material specifications	Diameter of wheel	Minimum thickness of band A	Minimum diameter of rivets	Maximum distance between centers of rivets
	Inches	*Inches*	*Inches*	*Inches*
Hot rolled steel SAE 1008	Under 8	1/16	3/16	¾
	8 to 24	⅛	¼	1
	Over 24 to 30	¼	⅜	1¼

TABLE 0-4 – Minimum Dimensions for Straight Unrelieved Flanges for Wheels with Threaded Inserts or Projecting Studs

A Diameter of wheel	B[1] Minimum outside diameter of flange	T Minimum thickness of flange
Inches	*Inches*	*Inches*
1	⅝	⅛
2	1	⅛
3	1	3/16
4	1⅜	3/16
5	1¾	¼
6	2	⅜

[1] NOTE: Must be large enough to extend beyond the bushing. Where prong anchor or cupback bushing are used, this footnote does not apply.

TABLE O-5 – Minimum Dimensions for Straight Adapter Flange – for Organic Bonded Wheels over 1½" Thick[1]

Wheel diameter	Wheel hole diameter	B Minimum flange diameter	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of undercut	F[1] (D-E) minimum thickness
Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
12 to 14	4	6	⅞	⅜	½
	5	7	⅞	⅜	½
	6	8	⅞	⅜	½
Larger than 14 to 18	4	6	⅞	⅜	½
	5	7	⅞	⅜	½
	6	8	⅞	⅜	½
	7	9	⅞	⅜	½
	8	10	⅞	⅜	½
Larger than 18 to 24	6	8	1	½	½
	7	9	1	½	½
	8	10	1	½	½
	10	12	1	½	½
	12	14	1	½	½
Larger than 24 to 30	12	15	1	½	½
Larger than 30 to 36	12	15	1⅜	⅞	½

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[1] For wheels under 1¼ inches thick F dimension shall not exceed 40 percent of wheel thickness.

TABLE O-6 – Minimum Dimensions for Straight Relieved Flanges

A Diameter of wheel	B Minimum outside diameter of flanges	C Radial width of bearing surface Minimum	 Maximum	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of recess
Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
1	⅜	1/16	⅛	1/16	1/16
2	¾	⅛	3/16	⅛	3/32
3	1	⅛	3/16	3/16	3/32
4	1⅜	⅛	3/16	3/16	⅛
5	1¾	3/16	¼	¼	⅛
6	2	¼	½	⅜	3/16
7	2½	¼	½	⅜	3/16
8	3	¼	½	⅜	3/16
10	3½	5/16	⅝	⅜	¼
12	4	5/16	⅝	½	5/16
14	4½	⅜	¾	½	5/16
16	5½	½	1	½	5/16
18	6	½	1	⅝	⅜
20	7	⅝	1¼	⅝	⅜
22	7½	⅝	1¼	⅝	7/16
24	8	¾	1¼	⅝	7/16
26	8½	¾	1¼	⅝	½
28	10	⅞	1½	¾	½
30	10	⅞	1½	¾	⅝
36	12	1	2	⅞	¾
42	14	1	2	⅞	¾
48	16	1¼	2	1⅛	1
60	20	1¼	2	1¼	1 ⅛
72	24	1½	2½	1⅜	1¼

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[1] Flanges for wheels under 2 inches diameter may be unrelieved and shall be maintained flat and true.

TABLE O-7 – Minimum Dimensions for Straight Flanges – for Mechanical Grinders 12,500 SFPM to 16,500 SFPM[1]

Wheel diameter	Wheel hole diameter	B Minimum flange diameter	D Minimum thickness of flange at bore	E Minimum thickness of flange at edge of undercut	F[2] (D–E) minimum thickness
20	6	8	1	½	½
20	8	10	1½	¾	¾
24	12	15	2	1	1
30	12	15	2	1	1
36	12	15	2	1	1

[1] Flanges shall be of steel, quality SAE 1040 or equivalent, annealed plate, heat treated to R_c 25–30.

[2] For wheels under 1¼ inch thick F dimension shall not exceed 40 percent of wheel thickness.

TABLE O-8 – Minimum Dimensions for Straight Flanges Used as Wheel Sleeves for Precision Grinding Only

		B	D	E
Wheel diameter	Wheel hole diameter	Minimum outside diameter of flange	Minimum thickness of flange at bore	Minimum thickness of flange at edge of undercut
Inches	*Inches*	*Inches*	*Inches*	*Inches*
12 to 14	5	7	½	7/16
Larger than 14 to 20	5	7	⅝	7/16
	6	8	⅝	7/16
	8	10	⅝	7/16
	10	11½	⅝	7/16
	12	13½	⅝	7/16
Larger than 20 to 30	8	10	¾	½
	10	11½	¾	½
	12	13½	¾	½
	16	17½	¾	½
Larger than 30 to 42	12	13½	¾	½
	16	17½	¾	½
	18	19½	¾	½
	20	21½	¾	½
Larger than 42 to 60	16	20	1	¾
	20	24	1	¾
	24	29	1⅛	⅞

NOTE: These flanges may be clamped together by means of a central nut, or by a series of bolts or some other equivalent means of fastening. For hole sizes smaller than shown in this table, use table 12.

TABLE O-9 – Minimum Basic Thicknesses of Peripheral and Side Members for Safety Guards

Material used in construction of guard	Maximum thickness of grinding wheel	Grinding wheel diameters: 3 to 6 inches		Over 6 to 12 inches		Over 12 to 16 inches		Over 16 to 20 inches		Over 20 to 24 inches		Over 24 to 30 inches		Over 30 to 48 inches	
		A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Inches	*Inches*		*Inches*		*Inches*		*Inches*		*Inches*		*Inches*		*Inches*	
Material satisfactory [1] for speeds up to 8,000 SFPM. Cast iron (min. tensile strength 20,000 p.s.i.) Class 20.	2	1/4	1/4	3/8	5/16	1/2	3/8	5/8	1/2	7/8	5/8	1	3/4	1 1/4	1
	4	5/16	5/16	3/8	5/16	1/2	3/8	3/4	5/8	1	5/8	1 1/8	3/4	1 3/8	1
	6	3/8	5/16	1/2	7/16	5/8	1/2	1	5/8	1 1/8	3/4	1 1/4	7/8	1 1/2	1 1/8
	8			5/8	9/16	7/8	3/4	1	3/4	1 1/8	3/4	1 1/4	7/8	1 1/2	1 1/8
	10			3/4	11/16	7/8	3/4	1	3/4	1 1/8	3/4	1 1/4	7/8	1 1/2	1 1/8
	16					1 1/8	1	1 1/4	1	1 5/16	1	1 7/16	1 1/16	1 3/4	1 3/8
	20							1 3/8	1 1/8	1 3/8	1 1/8	1 1/2	1 3/8	2	1 5/8
Material satisfactory [1] for speeds up to 9,000 SFPM. Malleable iron (min. tensile strength 50,000 p.s,i.) Grade 32510.	2	1/4	1/4	3/8	5/16	1/2	3/8	5/8	1/2	3/4	5/8	7/8	3/4	1	7/8
	4	5/16	5/16	3/8	5/16	1/2	3/8	5/8	1/2	3/4	5/8	7/8	3/4	1 1/8	7/8
	6	3/8	5/16	1/2	7/16	5/8	1/2	3/4	5/8	7/8	5/8	1	3/4	1 1/4	7/8
	8			1/2	7/16	5/8	1/2	3/4	5/8	7/8	5/8	1	3/4	1 1/4	7/8
	10			1/2	7/16	5/8	1/2	3/4	5/8	7/8	5/8	1	3/4	1 1/4	7/8
	16					13/16	11/16	13/16	11/16	1	3/4	1 1/8	7/8	1 3/8	1
	20							7/8	3/4	1	3/4	1 1/8	7/8	1 1/2	1 1/8
Materials satisfactory [1] for speeds up to 16,000 SFPM. Steel castings (min. tensile strength 60,000 p.s.i.) Grade V60–30.	2	1/4	1/4	5/16	5/16	3/8	3/8	1/2	7/16	5/8	1/2	3/4	5/8	7/8	3/4
	4	1/4	1/4	1/2	1/2	1/2	1/2	9/16	1/2	5/8	1/2	3/4	5/8	1	3/4
	6	3/8	1/4	3/4	5/8	3/4	5/8	3/4	5/8	13/16	11/16	13/16	11/16	1 1/8	3/4
	8			7/8	3/4	7/8	3/4	7/8	3/4	7/8	3/4	15/16	13/16	1 3/8	1
	10			1	7/8	1	7/8	1	7/8	1 1/8	15/16	1 1/8	1	1 7/16	1 1/16
	16					1 1/4	1 1/8	1 1/4	1 1/8	1 1/4	1 1/8	1 1/4	1 1/8	1 13/16	1 7/16
	20							1 3/8	1 1/4	1 3/8	1 1/4	1 7/16	1 5/16	2 1/16	1 11/16
Structural steel (min. tensile strength 60,000 p.s.i.).	2	1/8	1/16	5/16	1/4	5/16	1/4	5/16	1/4	5/16	1/4	3/8	5/16	1/2	3/8
	4	1/8	1/16	3/8	5/16	3/8	5/16	3/8	5/16	3/8	5/16	3/8	5/16	1/2	3/8
	6	3/16	1/16	1/2	3/8	7/16	3/8	7/16	3/8	7/16	3/8	7/16	3/8	3/4	1/2
	8			1/2	3/8	9/16	7/16	9/16	7/16	9/16	7/16	5/8	1/2	3/4	1/2
	10			9/16	7/16	5/8	1/2	5/8	1/2	5/8	1/2	5/8	1/2	7/8	5/8
	16					5/8	9/16	3/4	5/8	3/4	5/8	13/16	11/16	1 1/16	13/16
	20							13/16	11/16	13/16	11/16	7/8	3/4	1 3/16	15/16

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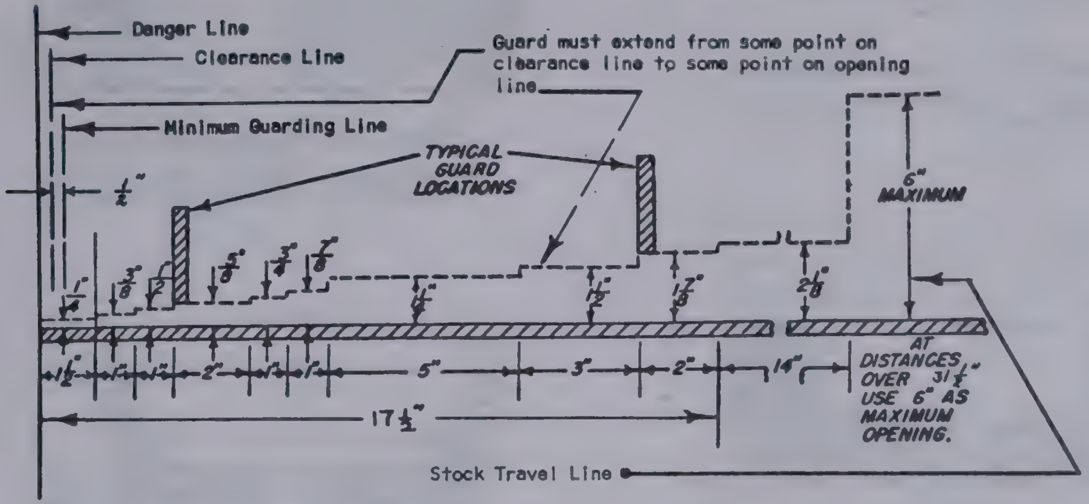
[1] The recommendations listed in the above table are guides for the conditions stated. Other material, designs or dimensions affording equal or superior protection are also acceptable.

TABLE O-10 – Diagram of Accepted Openings from Danger Line (point of operation)



Explanation of above diagram:

This diagram shows the accepted safe openings between the bottom edge of a guard and feed table at various distances from the danger line (point of operation).

The *clearance line* marks the distance required to prevent contact between guard and moving parts.

The *minimum guarding line* is the distance between the infeed side of the guard and the danger line which is one-half inch from the danger line.

The various openings are such that for average size hands an operator's fingers won't reach the point of operation.

After installation of point of operation guards and before a job is released for operation a check should be made to verify that the guard will prevent the operator's hands from reaching the point of operation.

Distance of opening from point of operation hazard (inches)	*Maximum width of opening (inches)*
½ to 1½	¼
1½ to 2½	⅜
2½ to 3½	½
3½ to 5½	⅝
5½ to 6½	¾
6½ to 7½	⅞
7½ to 12½	1¼
12½ to 15½	1½
15½ to 17½	1⅞
17½ to 31½	2⅛

This table shows the distances that guards shall be positioned from the danger line in accordance with the required openings.

P12

TABLE O-11 – Strength and Dimensions for Wood Ram Props

Size of timber, inches [1]	Square inches in cross section	Minimum allowable crushing strength parallel to grain, p.s.i.[2]	Maximum static load within short column range [3]	Safety factor	Maximum recommended weight of forging hammer for timber used	Maximum allowable length of timber, inches
4 x 4	16	5,000	80,000	10	8,000	44
6 x 6	36	5,000	180,000	10	18,000	66
8 x 8	64	5,000	320,000	10	32,000	88
10 x 10	100	5,000	500,000	10	50,000	100
12 x 12	144	5,000	720,000	10	72,000	132

[1] Actual dimension.

[2] Adapted from U.S. Department of Agriculture Technical Bulletin 479. Hardwoods recommended are those whose ultimate crushing strengths in compression parallel to grain are 5,000 p.s.i. (pounds per square inch) or greater.

[3] Slenderness ratio formula for short columns is $L/d=11$, where L=length of timber in inches and d=least dimension in inches; this ratio should not exceed 11.

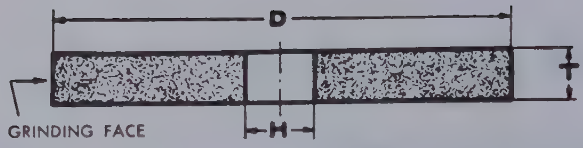


FIGURE O-1 – Type 1 Straight Wheels

Peripheral grinding wheel having a diameter, thickness and hole.

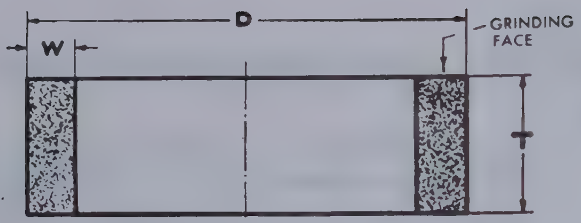


FIGURE O-2 – Type 2 Cylinder Wheels

Side grinding wheel having a diameter, thickness and wall—wheel is mounted on the diameter.

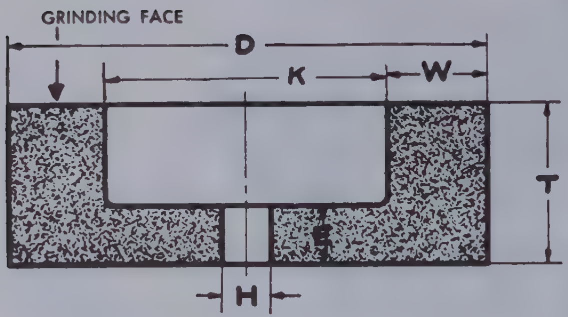


FIGURE O-3 – Type 6 Straight Cup Wheels

Side grinding wheel having a diameter, thickness and hole with one side straight or flat and the opposite side recessed. This type, however, differs from Type 5 in that the grinding is performed on the wall of the wheel. Therefore, the wall dimension "W" takes precedence over the diameter of the recess as an essential intermediate dimension to describe this shape type.

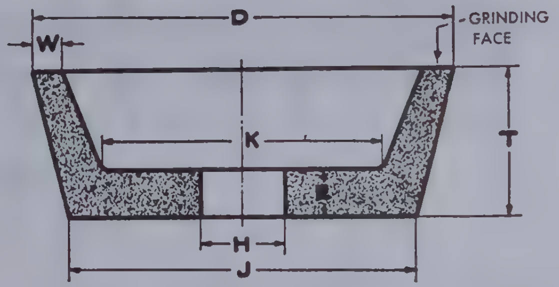
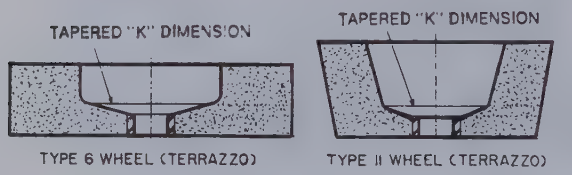


FIGURE O-4 – Type 11 Flaring Cup Wheels

Side grinding wheel having a wall flared or tapered outward from the back. Wall thickness at the back is normally greater than at grinding face (W).



TYPE 6 WHEEL (TERRAZZO)

TYPE II WHEEL (TERRAZZO)

FIGURE O-5 – Type 6 & 11 Wheels (Terrazzo)

Typical examples of modified types 6 and 11 wheels (terrazzo) showing tapered K dimensions.

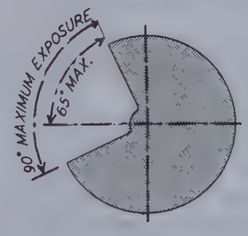


FIGURE O-6

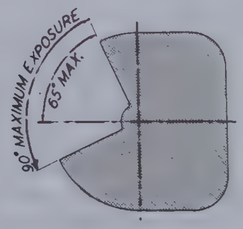


FIGURE O-7

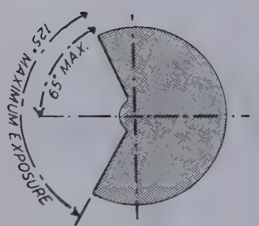


FIGURE O-8

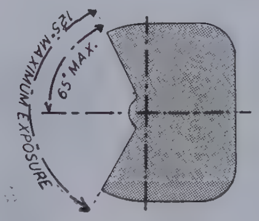


FIGURE O-9

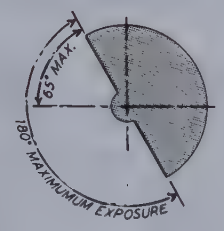


FIGURE O-10

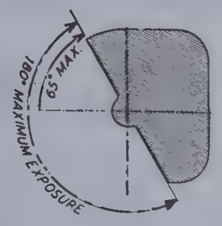


FIGURE O-11

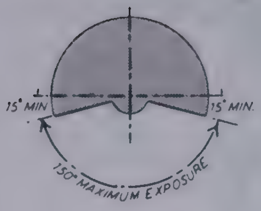


FIGURE 0-12

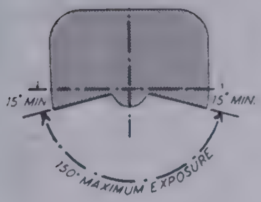


FIGURE 0-13

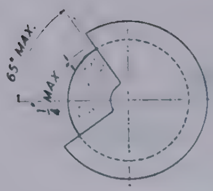


FIGURE 0-18

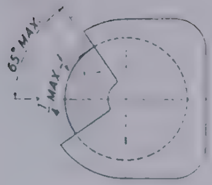


FIGURE 0-19

CORRECT

Showing adjustable tongue giving required angular protection for all sizes of wheel used.

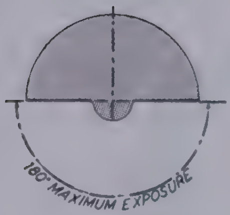


FIGURE 0-14

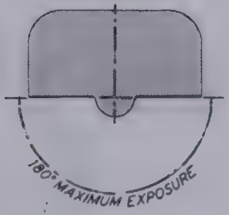


FIGURE 0-15

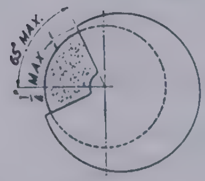


FIGURE 0-20

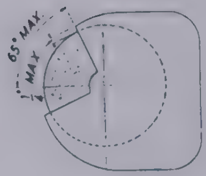


FIGURE 0-21

CORRECT

Showing movable guard with opening small enough to give required protection for smallest size wheel used.

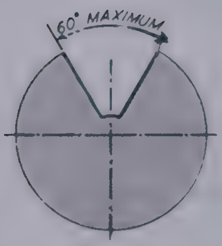


FIGURE 0-16

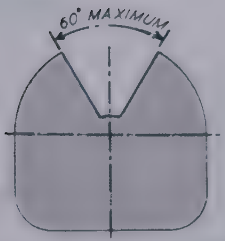


FIGURE 0-17

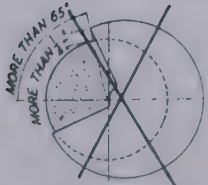


FIGURE 0-22

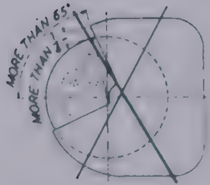


FIGURE 0-23

INCORRECT

Showing movable guard with size of opening correct for full size wheel but too large for smaller wheels.

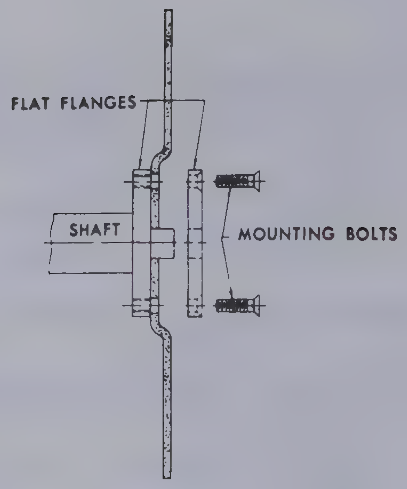


FIGURE 0-24

The Type 27A Wheel is mounted between flat non-relieved flanges of equal bearing surfaces.

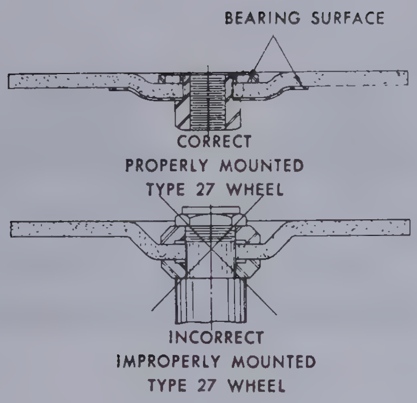
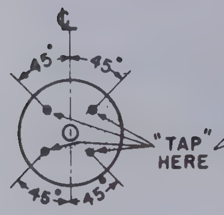


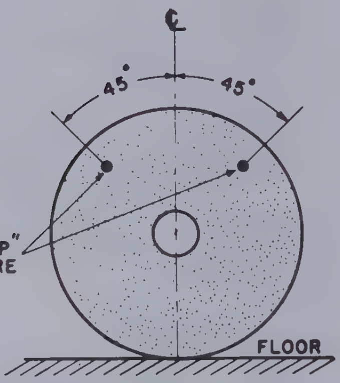
FIGURE 0-24a

Types 27 and 28 wheels, because of their shape, require specially designed adaptors.



Light Wheels
Suspend from hole by small pin or finger

FIGURE 0-25



Heavy Wheels
Support on clean hard floor

FIGURE 0-26

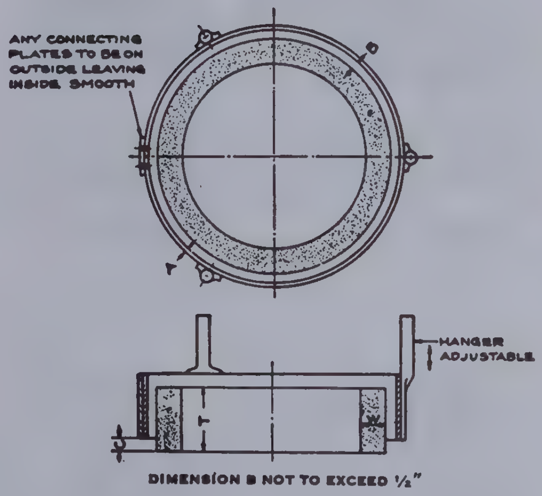

ANY CONNECTING PLATES TO BE ON OUTSIDE LEAVING INSIDE SMOOTH
B
A
HANGER ADJUSTABLE
T
W
C
DIMENSION B NOT TO EXCEED ½"

FIGURE 0-29

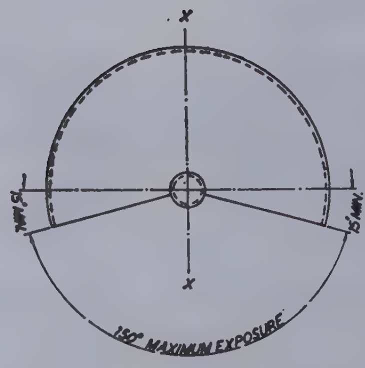
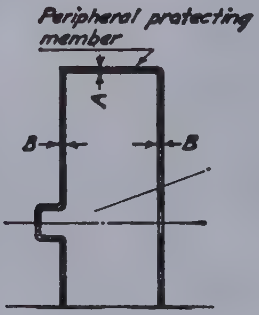


FIGURE 0-27



Section X-X

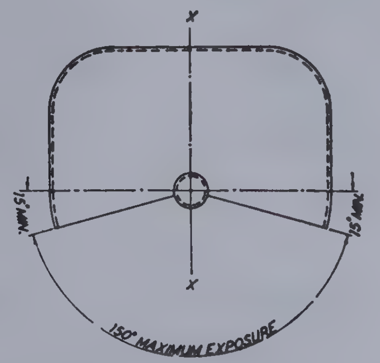
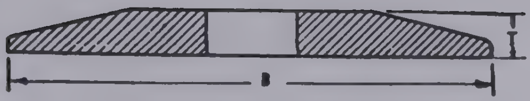
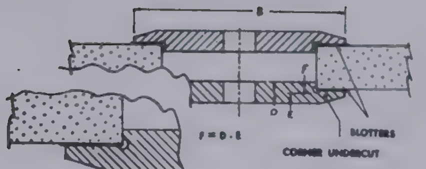


FIGURE 0-28



Driving flange secured to spindle for use only on portable wheels with threaded inserts or projectile studs.

FIGURE O-30



Driving flange secured to spindle

FIGURE O-33 – Central Nut Mounting

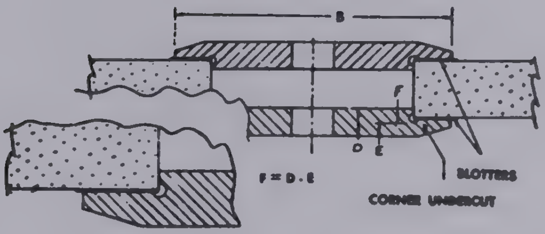
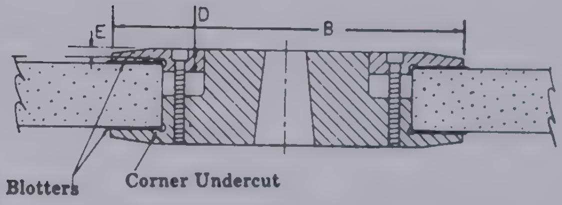
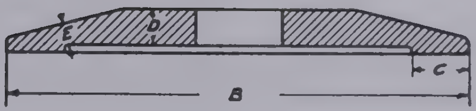


FIGURE O-31



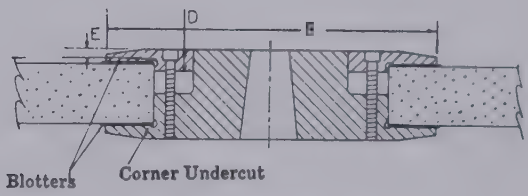
Driving flange secured to spindle

FIGURE O-34 – Multiple Screw Mounting



Driving flange secured to spindle.

FIGURE O-32



Driving flange secured to spindle

FIGURE O-35

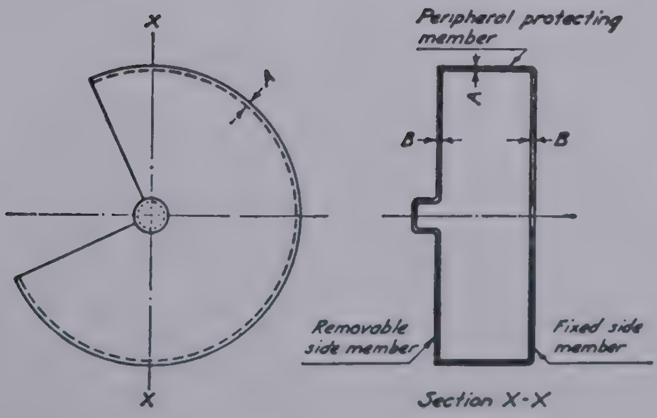


FIGURE O-36

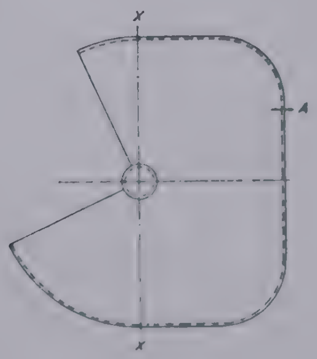


FIGURE O-37

OVERVIEW: SUBPART P

HAND-HELD AND PORTABLE POWER TOOLS AND OTHER HAND-HELD EQUIPMENT

This section applies to all industries and addresses the safe use of tools in the workplace.

General requirements, 1910.242, assigns responsibility for the safe operating condition of all workplace tools to the employer, even if the tools are furnished by the employee. This section also prohibits the use of compressed air over 30 p.s.i. for cleaning purposes.

Guarding of portable power tools, 1910.243, requires that all portable powered tools and portable machines (power saws, drills, pneumatic tools, portable belt sanders, portable abrasive wheels, portable grinders, etc.) be equipped with safety guards and constant-pressure controls. The section requires proper design, inspection, and grounding of tools; personal protective equipment where necessary; and safe operating procedures. Explosive-actuated fastening tools (excluding those used on soft construction materials and stud welding equipment) and power lawn mowers (but not flail, sicklebar, or commercial mowers) are also covered. Excluded are saws, grinders, and disc sanders with blade, wheel, or disc diameters of two inches or less; and belt sanders, reciprocating saws, saber, scroll, and jig saws with blade shanks over 1/4 inch. Circular saws used in meat cutting are not covered. Also exempt are: concrete vibrators and breakers; powered tampers; jack hammers; rock drills; garden, household, kitchen, and personal care appliances; fixed machines; and medical or dental equipment.

Other portable and equipment, 1910.244, covers the loading, operation, and maintenance of jacks and the safe use of abrasive blast cleaning nozzles.

Specific sections of the standard covered in the checklist:

Std. No. **Page No.**
1910.242 **Hand and portable power tools and equipment, general** P-01
1910.243 **Guarding of portable power tools** P-01
1910.244 **Other portable tools and equipment** P-05

DEFINITIONS — SUBPART P

Definitions applicable to abrasive wheels:

Mounted wheels. Either organic or inorganic bonded abrasive wheels, usually 2-inch diameter or smaller, and of various shapes.

Organic bonded wheels. Wheels which are bonded by means of an organic material such as resin, rubber, shellac, or other similar bonding agent.

Portable grinding. A grinding operation where the grinding machine is designed to be hand held and may by easily moved from one location to another.

Reinforced wheels. A class of organic wheels which contain strengthening fabric or filament. The term "reinforced" does not cover wheels using such mechanical additions as steel rings, steel cup backs or wire or tape winding.

Safety guard. An enclosure designed to restrain the pieces of the grinding wheel and furnish all possible protection in the event that the wheel is broken in operation.

Tuck pointing. Removal, by grinding, of cement, mortar, or other nonmetallic jointing material.

Tuck pointing wheels. Usually Type 1, reinforced organic bonded wheels having diameter, thickness and hole size dimension.

> **Limitation:** Wheels used for tuck pointing should be reinforced, organic bonded. (See (§) 1910.243(c)(1)(ii)(c).)

Type 1 straight wheels. Wheels have diameter, thickness, and hole size dimensions and should be used only on the periphery. Type 1 wheels shall be mounted between flanges.

> **Limitation:** Hole dimension (H) should not be greater than two-thirds of wheel diameter dimension (D) for precision, cylindrical, centerless, or surface grinding applications. Maximum hole size for all other applications should not exceed one-half wheel diameter.

Type 6 straight cup wheels. Wheels having diameter, thickness, hole size, rim thickness, and back thickness dimensions. Grinding is always performed on rim face, W dimension.

> **Limitation:** Minimum back thickness, E dimension, should not be less than one-fourth T dimension. In addition, when unthreaded hole wheels are specified, the inside flat, K dimension, must be large enough to accommodate a suitable flange.

Type 11 flaring cup wheels. Wheels having double diameter dimensions D and J, and in addition having thickness, hole size, rim and back thickness dimensions. Grinding is always performed on rim face, W dimension.

Definitions applicable to explosive-actuated fastening tools:

(To)chamber. To fit properly without the use of excess force,the case being duly supported.

Explosive powerload (load). Any substance in any form capable of producing a propellant force.

Hammer-operated piston tool—low-velocity type. A tool which, by means of a heavy mass hammer supplemented by a load, moves a piston designed to be captive to drive a stud, pin, or fastener into a work surface, always starting the fastener at rest and in contact with the work surface. It shall be so designed that when used with any load that accurately chambers in it and that is commercially available at the time the tool is submitted for approval, it will not cause such stud, pin, or fastener to have a mean velocity in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel.

High-velocity tool. A tool or machine which, when used with a load, propels or discharges a stud, pin or fastener, at velocities in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel, for the purpose of impinging it upon, affixing it to, or penetrating another object or material.

Low-velocity piston tool. A tool that utilizes a piston designed to be captive to drive a stud, pin, or fastener into a work surface. It shall be so designed that when used with any load that accurately chambers in it and that is commercially available at the time the tool is submitted for approval, it will not cause such stud, pin or fastener to have a mean velocity in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel.

Protective shield or guard. A device or guard attached to the muzzle end of the tool, which is designed to confine flying particles.

Stud, pin, or fastener. A fastening device specifically designed and manufactured for use in explosive-actuated fastening tools.

Tool. An explosive-actuated fastening tool, unless otherwise indicated, and all accessories pertaining thereto.

Definitions applicable to Jacks:

Jack. An appliance for lifting and lowering or moving horizontally a load by application of a pushing force.

Rating. The maximum working load for which the jack is designed to lift safely that load throughout its specified amount of travel.

Note: To raise the rated load of a jack,the point of application of the load, the applied force, and the length of lever arm should be those designated by the manufacturer for the particular jack considered.

SUBPART P - HAND AND PORTABLE POWERED TOOLS AND OTHER HAND - HELD EQUIPMENT

1910.242 — HAND AND PORTABLE POWERED TOOLS AND EQUIPMENT, GENERAL.

	YES	NO
(a) General Requirements. Are precautions taken to insure that all tools and equipment used by employees, including tools and equipment furnished by the employees, are in a safe condition? (a)		
(b) Compressed Air Used for Cleaning. Is compressed air that is used for cleaning reduced to less than 30 p.s.i.? (b)		
In addition to reduction of the air pressure to 30 p.s.i., is effective chip guarding and personal protective equipment provided? (b)		

1910.243 — GUARDING OF PORTABLE POWERED TOOLS

	YES	NO
(a) Portable Powered Tools. *Portable Circular Saws.* (a)(1) Are all portable, power-driven saws with a blade diameter greater than 2 inches equipped with guards above and below the base plate or shoe? (a)(1)(i)		
Does the upper guard cover the saw to the depth of the teeth, except for the minimum arc required to permit the base to be tilted for bevel cuts? (a)(1)(i)		
Does the lower guard cover the saw to the depth of the teeth, except for the minimum arc required to allow proper retraction and contact with the work? (a)(1)(i)		
When the tool is withdrawn from the work, does the lower guard automatically and instantly return to covering position? (a)(1)(i)		
The above item does not apply to circular saws used in the meat industry for meat cutting purposes. (a)(1)(ii)		
Switches and Controls. (a)(2) Are all hand-held powered circular saws having a blade diameter greater than 2 inches equipped with a constant pressure switch or control that will shut off the power when the pressure is released? (a)(2)(i)		
Are all electric, hydraulic or pneumatic chain saws and percussion tools without positive accessory holding means equipped with a constant pressure switch or control that will shut off the power when the pressure is released? (a)(2)(i)		
Are all hand-held gasoline powered chain saws equipped with a constant pressure throttle control that will shut off the power to the saw when the pressure is released? (a)(2)(i)		
Are the following hand-held tools equipped with a constant pressure switch or control: (a) hand-held powered drills, (b) cappers, (c) fastener drivers, (d) horizontal, vertical and angle grinders with wheels greater than 2 inches in diameter, disc sanders with discs greater than 2 inches in diameter, (e) belt sanders, (f) reciprocating saws, (g) saber, scroll, and jigsaws with blade shanks greater than a nominal one-fourth inch? (a)(2)(ii)		
A lock-on control may be provided if the turn-off can be accomplished by a single motion of the same finger or fingers that turn it on. (a)(2)(ii)		
Are all other hand-held powered tools equipped with a positive on-off control or other controls as described by the items under (a)(2)(i) and (ii) above? (a)(2)(iii)(a)		

1910.243 — GUARDING OF PORTABLE POWERED TOOLS

	YES	NO
Are all saber, scroll, or jigsaws with nonstandard blade holders that use blades with shanks which are not of uniform width equipped so that the narrowest portion of the blade shank is an integral part of the blade mounting? (a)(2)(iii)(b)		
Is the blade shank width measured at the narrowest portion of the blade shank when saber, scroll and jigsaws have nonstandard blade holders? (a)(2)(iii)(c)		
NOTE: Nominal in this subparagraph means plus or minus .05 inch. (a)(2)(iii)(d)		
Is the operating control on hand-held power tools so located as to minimize the possibility of its accidental operation, if such accidental operation would constitute a hazard to employees? (a)(2)(iv)		
The above does not apply to concrete vibrators, concrete breakers, powered campers, powered jackhammers, rock drills, garden appliances, household and kitchen appliances, personal care appliances, medical or dental equipment, or to fixed machinery. (a)(2)(v)		
Portable Belt Sanding Machines. (a)(3) Are all belt sanding machines provided with guards at each nip point where the sanding belt runs onto a pulley? (a)(3)		
Do these guards effectively prevent the hands or fingers of the operator from coming in contact with the nip points? (a)(3)		
Is the unused run of the sanding belt guarded against accidental contact? (a)(3)		
Cracked Saws. (a)(4) Are all cracked saws removed from service? (a)(4)		
Grounding. (a)(5) Do all portable electric powered tools meet the grounding requirements of subpart S? (a)(5)		
(b) Pneumatic Powered Tools and Hose. *Tool Retainer.* (b)(1) Is a tool retainer installed on each piece of utilization equipment which, without such a retainer, may eject the tool? (b)(1)		
Airhose. (b)(2) Is all hose and hose connections used for conducting compressed air to equipment designed for the pressure and service to which they are subjected? (b)(2)		
(c) Portable Abrasive Wheels. *General Requirements.* (c)(1) Are all abrasive wheels used only on machines provided with safety guards as defined in the items under (c)(1) through (4), with the following exceptions: (c)(1) The requirements of subparagraph (1) below do not apply to the following classes of wheels and conditions: (a) Wheels used for internal work while within the work being ground. (b) Mounted wheels used in portable operations. (c) Types 16, 17, 18, 18R, and 19 cones and plugs and threaded hole pot balls where the work offers protection. (c)(1)(i)		
Does the safety guard cover the spindle end, nut, and flange projections? (c)(1)(ii)(a)		

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YES NO

Is the safety guard mounted so as to maintain proper alignment with the wheel, and is the strength of the fastenings in excess of the strength of the guard? **(c)(1)(ii)(a)**

Exceptions: Safety guards on all operations where the work provides a suitable measure of protection to the operator may be so constructed that the spindle end, nut, and outer flange are exposed. Where the nature of the work is such as to entirely cover the side of the wheel, the side covers of the guard may be omitted. **(c)(1)(ii)(b)**

Exception: The spindle end, nut, and outer flange may be exposed on machines designed for and used with Types 6, 11, 27, and 28 abrasive wheels, cutting-off wheels, and tuckpointing wheels. **(c)(1)(ii)(c)**

Cup Wheels. **(c)(2)**

Are cup wheels protected by one of the following:

(i) Safety guards as specified in items under (1) above; or

(ii) Special "revolving cup guards" which mount behind the wheel and turn with it.

Are such special "revolving cup guards" made of steel or other material with adequate strength, and do they enclose the wheel sides upward from the back for one-third of the wheel thickness?

Is a clearance of not more than one-sixteenth inch maintained between the wheel and the guard; or (iii) Any other form of guard that will insure as good protection as that which would be provided by the guards specified in (i) (ii) above? **(c)(2)**

Vertical Portable Grinders. **(c)(3)**

Do safety guards used on machines known as right angle head or vertical portable grinders have a maximum exposure angle of 180°, and is the guard so located as to be between the operator and the wheel during use? **(c)(3)**

Is the adjustment of the guard such that pieces of an accidentally broken wheel will be deflected away from the operator? **(c)(3)**

Other Portable Grinders. **(c)(4)**

Is the maximum angular exposure of the grinding wheel periphery and sides for safety guards used on other portable grinding machines so installed that it will not exceed 180°, and is the top half of the wheel enclosed at all times? **(c)(4)**

Mounting and Inspection of Abrasive Wheels. **(c)(5)**

Immediately before mounting, are wheels closely inspected and sounded by the user to make sure they have not been damaged in transit, storage, or otherwise? **(c)(5)(i)**

Is the spindle speed of the machine checked before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel? **(c)(5)(i)**

Do grinding wheels fit freely on the spindle and do they remain free under all grinding conditions? **(c)(5)(ii)**

Are all contact surfaces of wheels, blotters, and flanges flat and free of foreign matter? **(c)(5)(iii)**

When a bushing is used in the wheel, are precautions taken to insure that it does not exceed the width of the wheel and will not contact the flanges? **(c)(5)(iv)**

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YES NO

Excluded Machinery. **(c)(6)**

Natural sandstone wheels and metal, wooden, cloth or paper discs having a layer of abrasive on the surface are not covered by this paragraph. **(c)(6)**

(d) Explosive Actuated Fastening Tools.

General Requirements. **(d)(1)**

Do explosive-actuated fastening tools which are actuated by explosives or any similar means and propel a stud, pin, fastener, or other object meet the design requirements in ANSI A10.3-1970? **(d)(1)(i)**

Are operators and their assistants who use tools as above, safeguarded by means of eye protection? **(d)(1)(ii)**

Are the items in subpart I used to determine whether or not head and face protection are required? **(d)(1)(ii)**

Inspection, Maintenance, and Tool Handling. **(d)(2)**

High-Velocity Tools. **(d)(2)(i)**

Do tools of this type have the characteristics outlined in (a) through (h) below? **(d)(2)(i)**

Is the muzzle end of the tool provided with a protective shield or guard at least 3½ inches in diameter, mounted perpendicular to and concentric with the barrel, and designed to confine any flying fragements or particles that might otherwide create a hazard at the time of firing? **(d)(2)(i)(a)**

Where a standard shield or guard cannot be used, or where it does not cover all apparent avenues through which flying particles might escape, is there a special shield, guard, fixture, or jig designed and built by the manufacturer of the tool being used, which provides the same protection? **(d)(2)(i)(b)**

Is the tool so designed that it cannot be fired unless it is equipped with a standard protective shield or any other guard, or special shield, guard, fixture, or jig? **(d)(2)(i)(c)**

(1) Is the firing mechanism so designed that the tool can. not fire during loading or preparation to fire, or if the tool should be dropped while loaded?

(2) Is the firing of the tool dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position? **(d)(2)(i)(d)**

Is the tool designed so as not to be operable except where it is against a work surface, and unless the operator is holding the tool against the work surface with a force at least 5 pounds greater than the total weight of the tool? **(d)(2)(i)(e)**

Is the tool so designed that it will not operate when equipped with the standard guard indexed to the center position, if any bearing surface of the guard is tilted more than 8° from contact with the work surface? **(d)(2)(i)(f)**

Is the tool so designed that positive means of varying the power are available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force? **(d)(2)(i)(g)**

Is the tool so designed that all breaching parts will be reasonably visible to allow a check for any foreign matter that may be present? **(d)(2)(i)(h)**

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	YES	NO
Do tools of the low-velocity-piston type have the characteristics outlined in (a) through (e) below? **(d)(2)(ii)**		
Is the muzzle end of the tool designed so that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel? **(d)(2)(ii)(a)**		
Is a standard spall shield supplied with each tool? **(d)(2)(ii)(a)**		
Is the tool designed so that it will not propel or discharge a stud, pin, or fastener while loading or during preparation to fire, or if the tool should be dropped while loaded? **(d)(2)(ii)(b)**		
Is the firing of the tool dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operating of bringing the tool into the firing position? **(d)(2)(ii)(b)**		
Is the tool so designed as not to be operable other than against a work surface, and unless the operator is holding the tool against the work surface with a force at least 5 pounds greater than the total weight of the tool? **(d)(2)(ii)(c)**		
Is the tool so designed that a positive means of varying the power is available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force? **(d)(2)(ii)(d)**		
Is the tool so designed that all breaching parts will be reasonably visible to allow a check for any foreign matter that may be present? **(d)(2)(ii)(e)**		
Do tools of the hammer-operated piston tools-low-velocity type have the characteristics as outlined in (a) through (e) below? **(d)(2)(iii)**		
Is the muzzle end of the tool so designed that suitable protective shields, guards, jigs, or fixtures, designed and built by the manufacturer of the tool being used, can be mounted perpendicular to the barrel, and is a standard spall shield supplied with each tool? **(d)(2)(iii)(a)**		
Is the tool so designed that it will not in ordinary usage propel or discharge a stud, pin, or fastener while loading, or during preparation to fire, or if the tool should be dropped while loaded? **(d)(2)(iii)(b)**		
Is the firing of the tool dependent upon at least two separate and distinct operations of the operator, with the final firing movement being separate from the operation of bringing the tool into the firing position? **(d)(2)(iii)(c)**		
Is the tool so designed that positive means of varying the power is available or can be made available to the operator as part of the tool, or as an auxiliary, in order to make it possible for the operator to select a power level adequate to perform the desired work without excessive force? **(d)(2)(iii)(d)**		
Is the tool so designed that all breaching parts will be reasonably visible to allow a check for any foreign matter that may be present? **(d)(2)(iii)(e)**		
Requirements for Loads and Fasteners. **(d)(3)**		
Is there a standard means of identifying the power levels of loads used in tools? **(d)(3)(i)**		

1910.243 — GUARDING OF PORTABLE POWERED TOOLS

	YES	NO
Are precautions taken to insure that no load (cased or caseless) will be used if it will accurately chamber in any existing approved commercially available low-velocity piston tool or hammer operated piston tool - low-velocity type, and will cause a fastener to have a mean velocity in excess of 300 feet per second when measured 6.5 feet from the muzzle end of the barrel? **(d)(3)(iii)**		
Are precautions taken to insure that no individual test firing of a series will exceed 300 feet per second by more than 8 percent? **(d)(3)(iii)**		
Are precautions taken to insure that fasteners used in tools will be only those specifically manufactured for use in such tools? **(d)(3)(iv)**		
Operating Requirements. **(d)(4)**		
Before using a tool, do all operators inspect it to determine to their satisfaction that it is clean, that all moving parts operate freely, and that the barrel is free from obstructions? **(d)(4)(i)**		
Are operators instructed to immediately cease using a tool if it develops a defect during its use? **(d)(4)(ii)**		
Are tools only loaded just prior to the intended firing time? **(d)(4)(iii)**		
Are precautions taken to insure that neither loaded nor empty tools are to be pointed at any workmen? **(d)(4)(iii)**		
Are precautions taken to insure that tools will not be loaded unless being prepared for immediate use, and that unattended tools are not left loaded? **(d)(4)(iv)**		
In cases of misfire, is the operator instructed to hold the tool in the operating position for at least 30 seconds, at which time he will try to operate the tool a second time, and if it again misfires is he instructed to hold the tool another 30 seconds, then is he instructed to proceed to remove the explosive load in strict accordance with the manufacturer's instructions? **(d)(4)(v)**		
Are precautions taken to insure that tools will never be left unattended in a place where they would be available to unauthorized persons? **(d)(4)(vi)**		
Are precautions taken to insure that fasteners will not be driven into very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface-hardened steel, glass block, live rock, face brick, or hollow tile? **(d)(4)(vii)**		
Are precautions taken to insure that driving into materials easily penetrated will be avoided, unless such materials are backed by a substance that will prevent the pin or fastener from passing completely through and creating a flying-missile hazard on the other side? **(d)(4)(viii)**		
(a) Are instructions given that fasteners will not be driven directly into materials such as brick or concrete closer than 3 inches from the unsupported edge or corner, or into steel surfaces closer than one-half inch from the unsupported edge or corner, unless a special guard, fixture, or jig is used? (b) When fastening other materials, such as a 2-by 4-inch wood section to a concrete surface, it is permissible to drive a fastener of no greater than 7/32-inch shank diameter not closer than 2 inches from the unsupported edge or corner of the work surface. **(d)(4)(ix)**		

Are precautions taken to insure that fasteners will not be driven through existing holes unless a positive guide is used to secure accurate alignment? (d)(4)(x)

Are precautions taken to insure that no fastener will be driven into a spalled area caused by an unsatisfactory fastening? (d)(4)(xi)

Are precautions taken to insure that tools will not be used in explosive or flammable atmospheres? (d)(4)(xii)

Are precautions taken to insure that all tools will be used with the correct shield, guard, or attachment recommended by the manufacturer? (d)(4)(xiii)

Are precautions taken to insure that any tool found not in proper working order will be immediately removed from service and inspected? (d)(4)(xiv)

Are tools inspected at regular intervals, and are they repaired in accordance with the manufacturer's specifications? (d)(4)(xiv)

(e) Power Lawnmowers.

General Requirements. (e)(1)

Do power lawnmowers of the walk-behind, riding-rotary, and reel power lawnmowers meet the design specifications of ANSI B71.1-X1968? (e)(1)(i)

NOTE: These specifications do not apply to walk-behind mowers which have been converted to a riding mower by the addition of a sulky, flail mowers, sicklebar mowers, or mowers designed for commercial use. **Revised 1985**

Are all power-driven chains, belts, and gears so positioned or otherwise guarded to prevent the operator's accidental contact therewith during normal starting, mounting, and operation of the machine? (e)(1)(ii)

Is there a shutoff device provided to stop operation of the motor or engine? (e)(1)(iii)

Does this device require manual and intentional reactivation to restart the motor or engine?

Are all positions of the operating controls clearly identified? (e)(1)(iv)

Are the words, "Caution. Be sure the operating control(s) is in neutral before starting the engine," or similar wording clearly visible at an engine starting control point on selfpropelled motors? (e)(1)(v)

Walk-Behind and Riding Rotary Motors. (e)(2)

Is the mower blade enclosed except on the bottom, and does the enclosure extend to or below the lowest cutting point of the blade in the lowest blade position? (e)(2)(i)

Do guards which must be removed to install a catcher assembly comply with the following:

(a) Are warning instructions affixed to the mower near the opening stating that the mower shall not be used without either the catcher assembly or the guard in place?

(b) Is the catcher assembly or the guard shipped and sold as part of the mower?

(c) Does the instruction manual state that the mower shall not be used without either the catcher assembly or the guard in place?

(d) Are precautions taken to insure that the catcher assembly, when properly and completely installed, will not create a condition which violates the limits given for the guarded opening? (e)(2)(ii)

Are openings in the blade enclosure, intended for the discharge of grass, limited to a maximum vertical angle of the opening of 30°, and are measurements taken from the lowest blade position? (e)(2)(iii)

Does the total effective opening area of the grass discharge opening(s) not exceed 1,000 square degrees on units having a width of cut less than 27½ inches, or 2,000 square degrees on units having a width of cut 27½ inches or over? (e)(2)(iv)

Is the word "Caution" or stronger wording placed on the mower at or near each discharge opening? (e)(2)(v)

Do blade(s) stop rotating from the manufacturer's specified maximum speed within 15 seconds after declutching, or shutting of power? (e)(2)(vii)

In a multipiece blade, are the means of fastening the cutting members to the body of the blade or disc so designed that they will not become worn to a hazardous condition before the cutting members themselves are worn beyond use? (e)(2)(viii)

Is the maximum tip speed of any blade limited to 19,000 feet per minute? (e)(2)(ix)

Walk-Behind Rotary Mowers. (e)(3)

Is the horizontal angle of the opening(s) in the blade enclosure, that is intended for the discharge of grass, prohibited from contacting the operator area? (e)(3)(i)

Is there one of the following at all openings in the blade enclosure intended for the discharge of grass:

(a) A minimum unobstructed horizontal distance of 3 inches from the end of the discharge chute to the blade tip circle; or

(b) A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. (e)(3)(ii)

Is the bottom of the bar no higher than the bottom edge of the blade enclosure? (e)(3)(ii)

Are the highest point(s) on the front of the blade enclosure, except discharge openings, such that any line extending a maximum of 15° downward from the horizontal toward the blade shaft axis does not intersect the horizontal plane within the blade tip circle? (e)(3)(iii)

Are precautions taken to insure that the highest point(s) on the blade enclosure, front, except discharge openings, will not exceed 1¼ inches above the lowest cutting point of the blade in the lowest blade position? (e)(3)(iii)

Do mowers with a swing-over handle comply with the items under (2)(i) of this checklist above? (e)(3)(iii)

Is the mower handle fastened to the mower so as to prevent loss of control by unintentional uncoupling while in operation? (e)(3)(iv)

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	YES	NO
Is a positive upstop or latch provided for the mower handle in the normal operating position(s)? (e)(3)(v)		
Is the upstop not subject to unintentional disengagement during normal operation of the mower? (e)(3)(v)		
Does the upstop or latch prohibit the center or the handle grips from coming closer than 17 inches horizontally behind the closest path of the mower blade(s) unless manually disengaged? (e)(3)(v)		
NOTE: A swing-over handle, which complies with the above requirements, is permitted. (e)(3)(vi)		
Do wheel drive disengaging controls, except deadman controls, move opposite to the direction of the vehicle motion in order to disengage the drive? (e)(3)(vii)		
Do deadman controls automatically interrupt power to a drive when the operator's actuating force is removed? **Revised 1985** (e)(3)(vii)		
Are deadman controls designed so they may operate in any direction to disengage the drive? **Revised 1985** (e)(3)(vii)		
Riding Rotary Mowers. (e)(4)		
Is the highest point(s) of all openings in the blade enclosure, front, limited by a vertical angle of opening of 15° and a maximum distance of 1¼ inches above the lowest cutting point of the blade in the lowest blade position? (e)(4)(i)		
Are opening(s) placed so that grass or debris will not discharge directly toward any part of an operator seated in a normal operator position? (e)(4)(ii)		
Is one of the following items located at all openings in the blade enclosure intended for the discharge of grass: (a) A minimum unobstructed horizontal distance of 6 inches from the end of the discharge chute to the blade tip circle; or (b) A rigid bar fastened across the discharge opening, secured to prevent removal without the use of tools. (e)(4)(iii)		
Is the bottom of the bar no higher than the bottom edge of the blade enclosure? (e)(4)(iii)		
Are mowers provided with stops to prevent jackknifing or locking of the steering mechanism? (e)(4)(iv)		
Are vehicle stopping means provided? (e)(4)(v)		
Do hand-operated wheel drive disengaging controls move opposite to the direction of vehicle motion in order to disengage the drive? (e)(4)(vi)		
Are foot-operated wheel drive disengaging controls required to be depressed to disengage the drive? (e)(4)(vi)		
Do deadman controls, both hand and foot operated, automatically interrupt power to a drive when the operator's actuating force is removed? **Revised 1985** (e)(4)(vi)		
Are deadman controls designed so they may operate in any direction to disengage the drive? **Revised 1985** (e)(4)(vi)		

1910.244 — OTHER PORTABLE TOOLS AND EQUIPMENT

	YES	NO
(a) Jacks.		
Loading and Marking. (a)(1)		
Are instructions given to operators to make sure that the jack used has a rating sufficient to lift and sustain the load? (a)(1)(i)		
Is the rated load legibly and permanently marked in a prominent location on the jack by casting, stamping, or other suitable means? (a)(1)(ii)		
Operation and Maintenance. (a)(2)		
In the absence of a firm foundation is the base of the jack blocked? (a)(2)(i)		
If there is a possibility of slippage of the cap, is a block placed in between the cap and the load? (a)(2)(i)		
Is the operator required to watch the stop indicator, which must be kept clean, in order to determine the limit of travel? (a)(2)(ii)		
Is the operator prohibited from overrunning the limit? (a)(2)(ii)		
After the load has been raised, is it required to be cribbed, blocked, or otherwise secured at once? (a)(2)(iii)		
Are hydraulic jacks that are exposed to freezing temperatures supplied with an adequate antifreeze liquid? (a)(2)(iv)		
Are all jacks properly lubricated at regular intervals? (a)(2)(v)		
Are jacks thoroughly inspected at the times which depend upon the service conditions? (a)(2)(vi)		
Are inspections not less frequent than the following: (a) For constant or intermittent use at one locality, once every 6 months, (b) For jacks sent out of the shop for special work, when they are sent out and when returned, (c) If a jack is subjected to abnormal load or shock, immediately before and immediately thereafter? (a)(2)(vi)		
Are repair or replacement parts examined for possible defects? (a)(2)(vii)		
Are jacks which are out of order tagged accordingly, and are they prohibited from being used until repairs are made? (a)(2)(viii)		
(b) Abrasive Blast Cleaning Nozzles.		
Are blast cleaning nozzles equipped with an operating valve which must be held open manually? (b)		
Is a support provided on which the nozzle may be mounted when it is not in use? (b)		

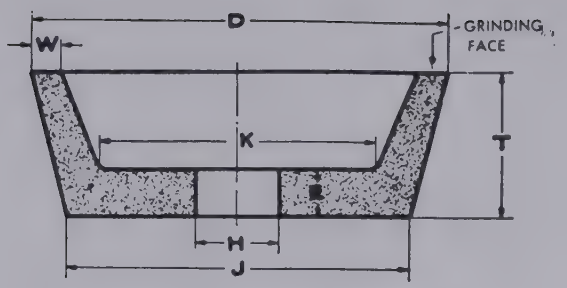

FIGURE P-1 – Type 11 Flaring Cup Wheel

Side grinding wheel having a wall flared or tapered outward from the back. Wall thickness at the back is normally greater than at the grinding face (W).

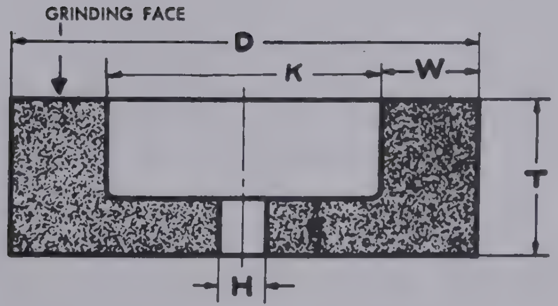

FIGURE P-2 – Straight Cup Wheel

Side grinding wheel having a diameter, thickness and hole with one side straight or flat and the opposite side recessed. This type, however, differs from Type 5 in that the grinding is performed on the wall of the abrasive created by the outside diameter of the wheel. Therefore, the wall dimension "W" takes precedence over the diameter of the recess as an essential intermediate dimension to describe this shape type.

T3

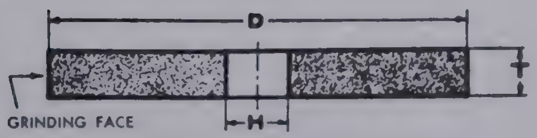

FIGURE P-3 – Straight Wheel

Peripheral grinding wheel having a diameter, thickness and hole.

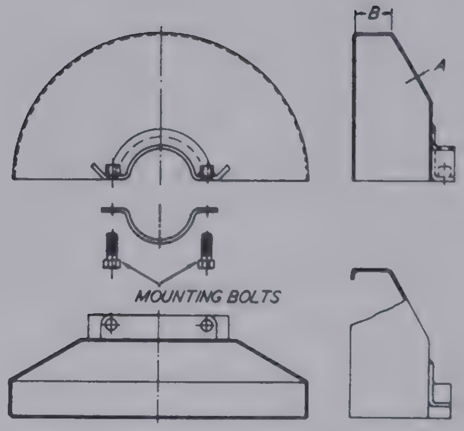

FIGURE P-4

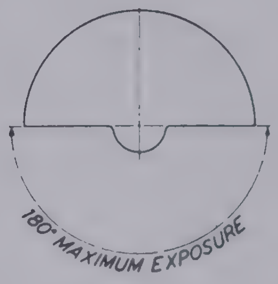

FIGURE P-5

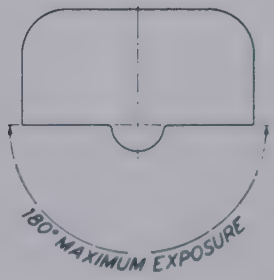

FIGURE P-6

OVERVIEW: SUBPART Q

WELDING, CUTTING, AND BRAZING

This section applies to all general industry employers whose work involves welding, cutting, and/or brazing. Included are requirements for the safe handling and storage of fuel gas used in welding operations; fuel gas cylinders; safe installation of fuel gas systems; and safe operating procedures for welding, cutting, brazing, arc welding, and resistance welding. Also covered are employee training and protection (especially eye protection); fire protection and equipment grounding; ventilation; first aid; confined spaces; and work with metals containing zinc; lead, beryllium, cadmium, and mercury.

T1

YES NO

1910.251 — DEFINITIONS

Welder and welding operator. Any operator of electric or gas welding and cutting equipment.

Approved. Listed or approved by a nationally recognized testing laboratory. Refer to 1910.155(c)(3) for definitions of listed and approved, and 1910.7 for nationally recognized testing laboratory.

[**Note:** All other welding terms are used in accordance with American Welding Society—Terms and Definitions—A3.0—969.]

1910.252 — GENERAL REQUIREMENTS

Fire Prevention and Protection

Basic Precautions

For elaboration of these basic precautions and of the special precautions of paragraph (a)(2) of this section, as well as a delineation of the fire protection and prevention responsibilities of welders and cutters, their supervisors (including outside contractors), and those in management on whose property cutting and welding is to be performed, see Standard for Fire Prevention in Use of Cutting and Welding Processes, NFPA Standard 51B, 1962. **(a)(1)**

Fire Hazards

If the object to be welded or cut cannot readily be moved, are all movable fire hazards in the vicinity taken to a safe place? **(a)(1)(i)**

Guards

If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, are guards used to confine the heat, sparks, and slag, and to protect the immovable fire hazards? **(a)(1)(ii)**

Restrictions

If the requirements stated in paragraphs (a)(1)(i) and (a)(1)(ii) cannot be followed, are welding and cutting prohibited? **(a)(2)(iii)**

Special Precautions

When the nature of the work to be performed falls within the scope of paragraph (a)(1)(ii), are the following additional precautions instituted: **(a)(2)**

Wherever there are floor openings or cracks in the flooring that cannot be closed, are precautions taken so that no readily combustible materials on the floor below will be exposed to sparks which might drop through the floor?

Are the same precautions observed with regard to cracks or holes in walls, open doorways, and open or broken windows? **(a)(2)(i)**

Is suitable fire extinguishing equipment maintained in a state of readiness for instant use? **(a)(2)(ii)**

[**Note:** Such equipment may consist of pails of water, buckets of sand, hose or portable extinguishers, depending upon the nature and quantity of the combustible material exposed.]

YES NO

1910.252 — GENERAL REQUIREMENTS

Fire Watch

Are fire watchers required whenever welding or cutting is performed in locations where other than a minor fire might develop, or if any of the following conditions exist:

> Appreciable combustible material in building construction or contents is closer than 35 feet (10.7 m) to the point of operation?
>
> Appreciable combustibles are more than 35 feet (10.7 m) away but easily ignited by sparks?
>
> Wall or floor openings within a 35-foot (10.7 m) radius expose combustible material in adjacent areas including concealed spaces in walls or floors?
>
> Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation? **(a)(2)(iii)(A)(1-4)**

Are fire watchers equipped with fire extinguishing equipment?

Is the equipment readily available, and the fire watchers trained in their use?

Are fire watchers familiar with facilities for sounding an alarm in the event of a fire?

Are fire watchers trained only to fight a fire that is obviously within the capacity of the equipment available?

If the fire is not within the capacity of the equipment, is the alarm sounded?

Is a fire watch maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires? **(a)(2)(iii)(B)**

Authorization

Before cutting or welding is permitted, is the area inspected by the individual responsible for authorizing cutting and welding operations?

Does this person designate precautions to be followed in granting authorization to proceed preferably in the form of a written permit? **(a)(2)(iv)**

Floors

Where combustible materials such as paper clippings, wood shavings, or textile fibers are on the floor, is the floor swept clean for a radius of 35 feet (10.7 m)?

Are combustible floors kept wet, covered with damp sand, or protected by fire-resistant shields?

Where floors have been wet down, are personnel operating arc welding or cutting equipment protected from possible shock? **(a)(2)(v)**

Prohibited Areas

Is cutting or welding prohibited in the following situations:

> In areas not authorized by management;
>
> In sprinklered buildings while such protection is impaired; and
>
> In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment which have previously contained such materials, or that may develop in areas with an accumulation of combustible dusts;

YES NO

In areas near the storage of large quantities of exposed readily ignitible materials such as bulk sulfur, baled paper, or cotton. **(a)(vi)(2)(A-D)**

Relocation of Combustibles

Where practicable, are all combustibles relocated at least 35 feet (10.7 m) from the work site?

Where this is impracticable, are combustibles protected with flame-proofed covers or otherwise shielded with metal or asbestos guards or curtains? **(a)(2)(vii)**

Ducts

Are ducts and conveyor systems that might carry sparks to distant combustibles suitably protected or shut down? **(a)(2)(viii)**

Combustible Walls

Where cutting or welding is done near walls, partitions, ceiling or roof of combustible construction, are fire-resistant shields or guards provided to prevent ignition? **(a)(2)(ix)**

Noncombustible Walls

If welding is to be done on a metal wall partition ceiling or roof, are precautions taken to prevent ignition of combustibles on the other side, due to conduction or radiation, preferably by relocating combustibles?

Where combustibles are not relocated, is a fire watch on the opposite side from the work provided? **(a)(2)(x)**

Combustible Cover

Is welding prohibited on a metal partition, wall, ceiling, or roof that has a combustible covering?

Is welding prohibited on walls or partitions of combustible sandwich-type panel construction? **(a)(2)(xi)**

Pipes

Is cutting or welding on pipes or other metal in contact with combustible walls, partitions, ceilings, or roofs prohibited if the work is close enough to cause ignition by conduction? **(a)(2)(xii)**

Management

Does management recognize its responsibility for the safe usage of cutting and welding equipment on its property?

Based on fire potentials of plant facilities, are there established areas for cutting and welding and established procedures for cutting and welding, in other areas?

Is there a designated individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes?

Does management insist that cutters, welders, and supervisors are suitably trained in the safe operation of their equipment and the safe use of the process?

Are all contractors advised about flammable materials or hazardous conditions? **(a)(2)(xiii)(A-C)**

Supervisor

Is the supervisor responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process?

YES NO

Does the supervisor determine the combustible materials and hazardous areas present or likely to be present in the work location? **(a)(2)(xiv)**

Does the supervisor protect combustibles from ignition by performing the following:

Moving the work to a location free from dangerous combustibles;

Have the combustibles moved to a safe distance from the work or have the combustibles properly shielded against ignition, if the work cannot be moved;

See that cutting and welding are so scheduled that plant operations that might expose combustibles to ignition are not started during cutting or welding;

Secure authorization for the cutting welding operations from the designated management representative;

Determine that the cutter or welder secures his or her approval that conditions are safe before going ahead;

Determine that fire protection and extinguishing equipment are properly located at the site?

Where fire watches are required, does the supervisor see that they are available at the site? **(a)(2)(xiv)(A-G)**

Fire Prevention Precautions

Is cutting or welding permitted only in areas that are or have been made fire safe?

When work cannot be moved practically, is the area made safe by removing combustibles or protecting combustibles from ignition sources? **(a)(2)(xv)**

Welding or Cutting Containers

Is welding, cutting, or other hot work performed on used drums, barrels, tanks, or other containers prohibited until they have been cleaned thoroughly?

After cleaning, is it absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which when subjected to heat might produce flammable or toxic vapors?

Are any pipe lines or connections to the drum or vessel disconnected or blanked? **(a)(3)(i)**

Venting and Purging

Are all hollow spaces, cavities, or containers vented to permit the escape of air or gases before preheating, cutting, or welding? **(a)(3)(ii)**

[OSHA recommends purging with inert gas.]

Confined Spaces

When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, are electrodes removed from the holders?

Are the holders carefully located so that accidental contact cannot occur and the machine be disconnected from the power source? **(a)(4)(i)**

YES NO

Torch Valve

When gas welding or cutting, are the torch valves closed and the gas supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight?

Where practicable, are the torch and hose removed from the confined space? **(a)(4)(ii)**

Protection of Personnel

Railings

Is a welder or helper working on platforms, scaffolds, or runways protected against falling? **(b)(1)(i)**

[**Note**: This may be accomplished by the use of railings, safety belts, life lines, or some other equally effective safeguards. See Subpart D for more information on fall protection.]

Welding Cables

Do welders place welding cables and other equipment so that it is clear of passageways, ladders, and stairways? **(b)(1)(ii)**

Eye Protection

Are helmets or hand shields used during all arc welding or arc cutting operations, excluding submerged arc welding?

Are helpers or attendants provided with proper eye protection? **(b)(2)(i)(A)**

Are goggles or other suitable eye protection used during all gas welding or oxygen cutting operations? **(b)(2)(i)(B)**

Are spectacles without side shields, with suitable filter lenses only permitted for use during gas welding operations on light work, for torch brazing or for inspection?

Do all operators and attendants of resistance welding or resistance brazing equipment use transparent face shields or goggles, depending on the particular job, to protect their faces or eyes? **(a)(2)(i)(c)**

Is eye protection in the form of suitable goggles provided where needed for brazing operations not covered in paragraphs (b)(2)(i)(A) through (b)(2)(i)(C) of this section? **(b)(2)(i)(D)**

Specifications for Protectors

Are helmets and hand shields made of a material which is an insulator for heat and electricity?

Are helmets, shields, and goggles made of material that is not readily flammable and capable of withstanding sterilization? **(b)(2)(ii)(A)**

Are helmets and hand shields arranged to protect the face, neck, and ears from direct radiant energy from the arc? **(b)(2)(ii(B)**

Are helmets provided with filter plates and cover plates designed for easy removal? **(b)(2)(ii)(C)**

Are all parts constructed of a material which will not readily corrode or discolor the skin? **(b)(2)(ii)(D)**

Are goggles ventilated to prevent fogging of the lenses as much as practicable? **(b)(2)(ii)(E)**

Is all glass for lenses tempered and free from striae, air bubbles, waves, and other flaws?

YES NO

Are the front and rear surfaces of lenses and windows smooth and parallel (except when a lens is ground to provide proper optical correction for defective vision)? **(b)(2)(ii)(F)**

Do lenses bear some permanent distinctive marking by which the source and shade may be readily identified? **(b)(2)(ii)(G)**

The following is a guide for the selection of the proper shade numbers; however, these recommendations may be varied to suit the individual's needs.

Welding operation	Shade No.
Shielded metal-arc welding—1/16-, 3/32-, 1/8-, 5/32-inch electrodes	10
Gas-shielded arc welding (nonferrous)— 1/16-, 3/32-, 1/8-, 5/32-inch electrodes	11
Gas-shielded arc welding (ferrous)—1/16-, 3/32-, 1/8-, 5/32-inch electrodes	12
Shielded metal-arc welding:	
3/16-, 7/32-, 1/4-inch electrodes	12
12 5/16-, 3/8-inch electrodes	14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to 1/8 inch	4 or 5
Gas welding (medium) 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy) 1/2 inch and over	6 or 8

[**Note**: In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation.] **(b)(2)(ii)(I)**

Do all filter lenses and plates meet the test for transmission of radiant energy prescribed in ANSI Z87.1—1968—American National Standard Practice for Occupational and Educational Eye and Face Protection? **(b)(2)(ii)(H)**

Protection from Arc Welding Rays

Where the work permits, is the welder enclosed in an individual booth painted with a finish of low reflectivity such as zinc oxide (an important factor for absorbing ultraviolet radiations) and lamp black; or, is the welder enclosed with noncombustible screens similarly painted?

Do booths and screens permit circulation of air at floor level?

Are workers or other persons adjacent to the welding areas protected from the rays by noncombustible or flame-proof screens or shields?

If not, are they required to wear appropriate goggles? **(b)(2)(iii)**

Protective Clothing

Are employees who are exposed to the hazards created by welding, cutting, or brazing operations protected by personal protective equipment in accordance with the requirements of 1910.132 of this part?

[**Note**: Appropriate protective clothing required for any welding operation will vary with the size, nature and location of the work to be performed.] **(b)(3)(i)**

1910.252 — GENERAL REQUIREMENTS

YES NO

Work in Confined Spaces

[**Note:** As used here, confined space is intended to mean a relatively small or restricted space such as a tank, boiler, pressure vessel, or small compartment of a ship.] **(b)(4)(i)**

Ventilation

Are all confined spaces ventilated? **(b)(4)(ii)**

[For ventilation requirements, see paragraph (c) of this section.]

Securing Cylinders and Machinery

When welding or cutting is being performed in any confined spaces, are the gas cylinders and welding machines left on the outside? **(b)(4)(iii)**

Before operations are started, is heavy portable equipment mounted on wheels securely blocked to prevent accidental movement?

Lifelines

Where a welder must enter a confined space through a manhole or other small opening, are means provided for quickly removing that welder in case of emergency?

When safety belts and lifelines are used for this purpose, are they attached to the welder's body so that he or she cannot be jammed in a small exit opening?

Is an attendant with a preplanned rescue procedure stationed outside to observe the welder at all times and capable of putting rescue operations into effect? **(b)(4)(iv)**

Electrode Removal

When arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, are electrodes removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine disconnected from the power source? **(b)(4)(v)**

Gas Cylinder Shutoff

When gas welding or cutting, are the torch valves closed and the fuel-gas and oxygen supply to the torch positively shut off at some point outside the confined area whenever the torch is not to be used for a substantial period of time?

Where practicable, are the torch and hose removed from the confined space? **(b)(4)(vi)**

Warning Sign

After welding operations are completed, does the welder mark the hot metal or provide some other means of warning other workers? **(b)(4)(vii)**

Health Protection and Ventilation

Screens

When welding must be performed in a space entirely screened on all sides, are the screens arranged so that no serious restriction of ventilation exists? **(c)(1)(i-ii)**

[**Note:** It is desirable to have the screen so mounted that they are about two feet (0.61 m) above the floor unless the work is performed at so low a level that the screen must be extended nearer to the floor to protect nearby workers from the glare of welding.]

1910.252 — GENERAL REQUIREMENTS

YES NO

Maximum Allowable Concentration

Are local exhaust or general ventilating systems provided and arranged to keep the amount of toxic fumes, gases, or dusts below the maximum allowable concentration as specified in 1910.1000? **(c)(1)(iii)**

Precautionary Labels

Do the suppliers of welding materials determine the hazard levels, if any, associated with the use of their materials in welding, cutting, etc.? **(c)(1)(iv)**

Do all filler metals and fusible granular materials carry the following notice (as a minimum) on tags, boxes, or other containers:

CAUTION:

Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. Use adequate ventilation. See ANSI Z49.1 — 1967 Safety in Welding and Cutting published by the American Welding Society. **(c)(1)(iv)(A)**

Do brazing (welding) filler metals containing cadmium in significant amounts carry the following notice on tags, boxes, or other containers:

WARNING:

CONTAINS CADMIUM — POISONOUS FUMES MAY BE FORMED ON HEATING. Do not breathe fumes. Use only with adequate ventilation such as fume collectors, exhaust ventilators, or air-supplied respirators. See ANSI Z49.1 — 1967. If chest pain, cough, or fever develops after use call physician immediately. **(c)(1)(iv)(B)**

Do brazing and gas welding fluxes containing fluorine compounds have a cautionary wording to indicate that they contain fluorine compounds?

One such cautionary wording recommended by the American Welding Society for brazing and gas welding fluxes reads as follows:

CAUTION:

CONTAINS FLUORIDES

This flux when heated gives off fumes that may irritate eyes, nose and throat.

1. Avoid fumes — use only in well-ventilated spaces.
2. Avoid contact of flux with eyes or skin
3. Do not take internally. **(c)(1)(iv)(C)**

Ventilation for General Welding and Cutting

Is mechanical ventilation provided when welding or cutting is done on metals not covered in paragraphs (c)(5) through (c)(12) of this section? **(c)(2)(i)**

Is it provided:

In a space of less than 10.000 cubic feet (284 m³) per welder?

In a room having a ceiling height of less than 16 feet (5 m)?

In confined spaces or where the welding space contains partitions, balconies, or other structural barriers to the extent that they significantly obstruct cross ventilation? **(c)(2)(i)(A-C)**

YES NO

[For specific materials, see the ventilation requirements of paragraphs (c)(5) through (c)(12) of this section.]

Minimum Rate

Is ventilation at the minimum rate of 2,000 cubic feet (57 m^3) per minute per welder, except where local exhaust hoods and booths as per paragraph (c)(3) of this section, or airline respirators approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health pursuant to provisions of 30 CFR Part 11? **(c)(2)(ii)**

[**Note:** Natural ventilation is considered sufficient for welding or cutting operations where the restrictions in paragraph (c)(2)(i) of this section are not present.]

Local Exhaust Hoods and Booths

Is mechanical local exhaust ventilation by means of either of the following:

Hoods. Freely movable hoods intended to be placed by the welder as near as practicable to the work being welded and provided with a rate of air-flow sufficient to maintain a velocity in the direction of the hood of 100 linear feet (30 m) per minute in the zone of welding when the hood is at its most remote distance from the point of welding. The rates of ventilation required to accomplish this control velocity using a 3-inch (7.6 cm) wide flanged suction opening are shown in the following table: **(c)(3)(i)**

Welding zone	Minimum air flow[1] cubic feet/minute	Duct diameter Inches[2]
4 to 6 inches from arc or torch	150	3
6 to 8 inches from arc or torch	275	3½
8 to 10 inches from arc or torch	425	4½
10 to 12 inches from arc or torch	600	5½

[1] When brazing with cadmium bearing materials or when cutting on such materials, increased rates of ventilation may be required.

[2] Nearest half-inch duct diameter based on 4,000 feet per minute velocity in pipe.

Fixed Enclosure. A fixed enclosure with a top and not less than two sides which surround the welding or cutting operation and with a rate of airflow sufficient to maintain a velocity away from the welder of not less than 100 linear feet (30 m) per minute. **(c)(3)(ii)**

Ventilation in Confined Spaces

Air Replacement

Are all welding and cutting operations in confined spaces adequately ventilated to prevent the accumulation of toxic materials or possible oxygen deficiency? **(c)(4)(i)**

(This applies not only to the welder but also to helpers and other personnel in the immediate vicinity.)

Is all air replacing withdrawn clean and respirable?

YES NO

Airline Respirators

In such circumstances where it is impossible to provide such ventilation, are airline respirators or hose masks approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health, pursuant to the provisions of 30 CFR Part 11? **(c)(4)(ii)**

Self-Contained Units

In areas immediately hazardous to life, are hose masks with blowers or self-contained breathing equipment used?

Is the breathing equipment approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health? **(c)(4)(iii)**

Outside Helper

Where welding operations are carried on in confined spaces and where welders and helpers are provided with hose masks, are hose masks with blowers or self-contained breathing equipment approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health? **(c)(4)(iv)**

Is a worker stationed on the outside of such confined spaces to insure the safety of those working within?

Oxygen for Ventilation

Is the use of oxygen for ventilation prohibited? **(c)(4)(v)**

Fluorine Compounds

In confined spaces, is welding or cutting involving fluxes, coverings, or other materials which contain fluorine compounds done in accordance with paragraph (c)(4) of this section?

[**Note:** A fluorine compound is one that contains fluorine, as an element in chemical combination, not as a free gas.The need for local exhaust ventilation or airline respirators for welding or cutting in other than confined spaces will depend upon the individual circumstances. However, experience has shown such protection to be desirable for fixed-location production welding and for all production welding on stainless steels. Where air samples taken at the welding location indicate that the fluorines liberated are below the maximum allowable concentration, such protection is not necessary.] **(c)(5)(i-ii)**

Zinc

In confined spaces, is welding or cutting which involves zinc-bearing base or filler metals or metals coated with zinc-bearing materials, done in accordance with paragraph (c)(4) of this section? **(c)(6)(i)**

If indoors, is welding or cutting involving zinc-bearing base or filler metals coated with zinc-bearing materials done in accordance with paragraph (c)(3) of this section? **(c)(6)(ii)**

Lead

In confined spaces, is welding involving lead-base metals (erroneously called lead-burning) done in accordance with paragraph (c)(4) of this section? **(c)(7)(i)**

If indoors, is welding involving lead-base metals done in accordance with paragraph (c)(3) of this section? **(c)(7)(ii)**

1910.252 — GENERAL REQUIREMENTS

YES NO

In confined spaces or indoors, is welding or cutting involving metals containing lead, other than as an impurity, or involving metals coated with lead-bearing materials including paint, done using local exhaust ventilation or airline respirators?

Are outdoor operations done using respiratory protective equipment approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health?

Are workers in the immediate vicinity of the cutting operation protected as necessary by local exhaust ventilation or airline respirators? **(c)(7)(iii)**

Beryllium

Is welding or cutting indoors, outdoors, or in confined spaces involving beryllium-containing base or filler metals done using local exhaust ventilation and airline respirators?

(An exception to this would be if atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations. See 1910.1000 for acceptable exposure limits.)

Are workers in the immediate vicinity of the welding or cutting operations protected as necessary by local exhaust ventilation or airline respirators? **(c)(8)(i)**

Cadmium

Is welding or cutting indoors or in confined spaces involving cadmium-bearing or cadmium-coated base metals done using local exhaust ventilation or airline respirators, unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations?

Are outdoor operations done using respiratory protective equipment such as fume respirators approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health? **(c)(9)(i)**

If the work is to be done in a confined space, is welding (brazing) involving cadmium-bearing filler metals done using ventilation as prescribed in paragraph (c)(3) or (c)(4) of this section? **(c)(9)(ii)**

Mercury

Is welding or cutting indoors or in a confined space involving metals coated with mercury-bearing materials including paint, done using local exhaust ventilation or airline respirators unless atmospheric tests under the most adverse conditions have established that the workers' exposure is within the acceptable concentrations?

Are outdoors operations done using respiratory protective equipment approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health? **(c)(10)(i)**

Cleaning Compounds

When using flammable cleaning materials, are appropriate precautions, such as manufacturers' instructions, followed? **(c)(11)(i)**

Degreasing

Is degreasing as well as other cleaning operations involving chlorinated hydrocarbons performed in an area where no vapors from these operations can reach or be drawn into the atmosphere surrounding any welding operation?

1910.252 — GENERAL REQUIREMENTS

YES NO

Are trichloroethylene and perchlorethylene kept out of atmospheres penetrated by the ultraviolet radiation of gas-shielded welding operations? **(c)(11)(ii)**

Cutting of Stainless Steels

Is oxygen cutting, using either a chemical flux or iron powder or gas-shielded arc cutting of stainless steel, done using mechanical ventilation adequate to remove the fumes generated? **(c)(12)(i)**

First-Aid Equipment

Is first-aid equipment available at all times, and is it rendered until medical attention can be provided?

Are all injuries reported as soon as possible for medical attention? **(c)(13)(i)**

Industrial Applications — Transmission Pipeline

Are the requirements of paragraphs (b) and (c) of this section and 1910.254 of this part observed? **(d)(1)(i)**

Field Shop Operations

Where field shop operations are involved for fabrication of fittings, river crossings, road crossings, and pumping and compressor stations, are the requirements of paragraphs (a), (b), and (c) of this section and 1910.253 and 1910.254 of this part observed? **(d)(1)(ii)**

Electric Shock

When arc welding is performed in wet conditions, or under conditions of high humidity, is special protection against electric shock supplied? **(d)(1)(iii)**

Pressure Testing

In pressure testing of pipelines, are workers and the public protected against injury by the blowing out of closures or other pressure-restraining devices?

Is protection provided against expulsion of loose dirt that may have become trapped in the pipe? **(d)(1)(iv)**

Construction Standards

Is the welded construction of transmission pipelines conducted in accordance with the Standard for Welding Pipe Lines and Related Facilities, API Std. 1104-1968? **(d)(1)(v)**

Flammable Substance Lines

Is the connection by welding of branches to pipelines carrying flammable substances performed in accordance with Welding or Hot Tapping on Equipment Containing Flammables, API Std. PSD No. 2201-1963? **(d)(1)(vi)**

X-Ray Inspection

Is the use of X-rays and radioactive isotopes for the inspection of welded pipeline joints carried out in conformance with the American National Standard Safety Standard for Non-Medical X-ray and Sealed Gamma-Ray Sources, ANSI Z54.1-1963? **(d)(1)(vii)**

Mechanical Piping Systems

Are the requirements of paragraphs (a), (b), and (c) of this section and 1910.254 of this part observed? **(d)(2)(i)**

X-Ray Inspection

Is the use of X-rays and radioactive isotopes for the inspection of welded piping done in conformance with the American National Standard Safety Standard for Non-Medical X-ray and Sealed Gamma-Ray Sources, ANSI Z54.1—1963? **(d)(2)(ii)**

T1

1910.253 — OXYGEN-FUEL GAS WELDING AND CUTTING

YES NO

General Requirements

Flammable Mixture

Are the mixtures of fuel gases and air or oxygen that may be explosive guarded against? **(a)(1)**

Is the use of devices or attachments facilitating or permitting mixtures of air or oxygen with flammable gases prior to consumption, except at the burner or in a standard torch, prohibited unless approved for the purpose? **(a)(1)(i)**

Maximum Pressure

Is acetylene prohibited from being generated, piped (except in approved cylinder manifolds), or utilized at a pressure in excess of 15 p.s.i.g. (103 kPa gauge pressure) or 30 p.s.i.g. (206 kPa absolute)?

[**Note:** This requirement is not intended to apply to storage of acetylene dissolved in a suitable solvent in cylinders manufactured and maintained according to U.S. Department of Transportation requirements, or to acetylene for chemical use.]

Is the use of liquid acetylene prohibited? **(a)(2)**

Apparatus

Is only approved apparatus such as torches, regulators or pressure-reducing valves, acetylene generators, and manifolds used? **(a)(3)**

Personnel

Are workers in charge of the oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems, trained and judged competent?

Are rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems, readily available? **(a)(4)**

Cylinders and Containers — Approval and Marking

Are all portable cylinders used for the storage and shipment of compressed gases constructed and maintained in accordance with the regulations of the U.S. Department of Transportation, 49 CFR parts 171-179? **(b)(1)(i)**

Are compressed gas cylinders legibly marked, for the purpose of identifying the gas content, with either the chemical or the trade name of the gas? **(b)(1)(ii)**

Is the marking done by means of stenciling, stamping, or labeling, and not readily removable?

Whenever practical, is the marking located on the shoulder of the cylinder?

Are compressed gas cylinders equipped with connections complying with the American National Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI B57.1—1965? **(b)(1)(iii)**

Are all cylinders with a water weight capacity of over 30 pounds (13.6 kg) equipped with means of connecting a valve protection cap or with a collar or recess to protect the valve? **(b)(1)(iv)**

Storage of Cylinders

Are cylinders kept away from radiators and other sources of heat? **(b)(2)(i)**

T1

1910.253 — OXYGEN-FUEL GAS WELDING AND CUTTING

YES NO

Inside of buildings, are cylinders stored in a well-protected, well-ventilated, dry location, at least 20 feet (6.1 m) from highly combustible materials such as oil or excelsior?

Are cylinders stored in definitely assigned places away from elevators, stairs, or gangways?

Are assigned storage spaces located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons?

Is storing cylinders in unventilated enclosures such as lockers and cupboards prohibited? **(b)(2)(ii)**

Do empty cylinders have their valves closed? **(b)(2)(iii)**

Where a cylinder is designed to accept a valve protection cap, is it always in place, hand-tight, except when cylinders are in use or connected for use? **(b)(2)(iv)**

Fuel-Gas Cylinder Storage

Inside a building, are cylinders, except those in actual use or attached ready for use, limited to a total gas capacity of 2,000 cubic feet (56 m³) or 300 pounds (135.9 kg) of liquefied petroleum gas? **(b)(3)(i)**

For storage in excess of 2,000 cubic feet (56 m³) total gas capacity of cylinders or 300 (135.9 kg) pounds of liquefied petroleum gas, is a separate room or compartment conforming to the requirements specified in paragraphs (f)(6)(i)(H) and (f)(6)(i)(I) of this section provided?

If not, are cylinders kept outside or in a special building?

Are the special buildings, rooms, or compartments void of flame for heating or lighting, and are they well ventilated?

Are acetylene cylinders stored valve end up? **(b)(3)(ii)**

Oxygen Storage

Are oxygen cylinders prohibited from being stored near highly combustible material, especially oil and grease?

Are oxygen cylinders prohibited from being stored near reserve stocks of carbide and acetylene or other fuel-gas cylinders, or near any other substance likely to cause or accelerate fire; or in an acetylene generator compartment? **(b)(4)(i)**

Are oxygen cylinders stored in outside generator houses separated from the generator or carbide storage rooms by a noncombustible partition having a fire-resistance rating of at least 1 hour?

Is this partition without openings, and is it gas-tight? **(b)(4)(ii)**

Are oxygen cylinders in storage separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet (6.1 m) or by a noncombustible barrier at least 5 feet (1.5 m) high having a fire-resistance rating of at least one-half hour? **(b)(4)(iii)**

Where a liquid oxygen system is to be used to supply gaseous oxygen for welding or cutting and the system has a storage capacity of more than 13,000 cubic feet of oxygen, connected in service or ready for service, or more than 25,000 cubic feet of oxygen including unconnected reserves on hand at the site, does such system comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566—1965? **(b)(4)(iv)**

1910.253 — OXYGEN-FUEL GAS WELDING AND CUTTING

YES NO

Operating Procedures

Are cylinders, cylinder valves, couplings, regulators, hose and apparatus kept free from oily or greasy substances?

Are oxygen cylinders or apparatus prohibited from begin handled with oily hands or gloves?

Is a jet of oxygen never permitted to strike an oily surface, greasy clothes, or enter a fuel oil or other storage tank? **(b)(5)(i)**

When transporting cylinders by a crane or derrick, is a cradle, boat, or suitable platform used?

Are slings or electric magnets prohibited from being used for this purpose?

Are valve-protection caps always in place? **(b)(5)(ii)(A)**

Are cylinders prohibited from being dropped or struck violently? **(b)(5)(ii)(B)**

Are valve-protection caps prohibited from being used for lifting cylinders from one vertical position to another?

Are bars prohibited from being used under valves or valve-protection caps to pry cylinders loose when frozen to the ground or otherwise fixed?

Are valve-protection caps designed to protect cylinder valves from damage? **(b)(5)(ii)(C)**

Unless cylinders are secured on a special truck, are regulators removed and valve-protection caps put in place before cylinders are moved? **(b)(5)(ii)(D)**

Do cylinders not having fixed hand wheels have keys, handles, or nonadjustable wrenches on valve stems while they are in service? **(b)(5)(ii)(E)**

(In multiple cylinder installations only one key or handle is required for each manifold.)

Are cylinder valves closed before moving cylinders? **(b)(5)(ii)(F)**

Are cylinder valves closed when work is finished?

Are valves of empty cylinders closed? **(b)(5)(ii)(G)**

Are cylinders kept far enough away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them, or are fire-resistant shields provided? **(b)(5)(ii)(H)**

Are cylinders prohibited from being placed where they might become part of an electric circuit?

Is contact with third rails, trolley wires, etc., avoided?

Are cylinders kept away from radiators, piping systems, layout tables, etc., that may be used for grounding electric circuits such as for arc welding machines?

Is any practice such as the tapping of an electrode against a cylinder to strike an arc prohibited? **(b)(5)(ii)(J)**

Are cylinders never used as rollers or supports, whether full or empty? **(b)(5)(ii)(K)**

Are the numbers and markings stamped into cylinders never tampered with? **(b)(5)(ii)(L)**

Are all people, except for the gas supplier, prohibited from to mixing gases in a cylinder?

Is no one, except the owner of the cylinder or person authorized by that owner, allowed to refill a cylinder? **(b)(5)(ii)(M)**

1910.253 — OXYGEN-FUEL GAS WELDING AND CUTTING

YES NO

Are employees prohibited from tampering with safety devices in cylinders or valves? **(b)(5)(ii)(N)**

Are cylinders prevented from being dropped or handled roughly? **(b)(5)(ii)(O)**

Unless connected to a manifold, is oxygen from a cylinder prohibited from being used without first attaching an oxygen regulator to the cylinder valve?

Before connecting the regulator to the cylinder valve, is the valve opened slightly for an instant and then closed?

Are workers instructed to stand to one side of the outlet when opening the cylinder valve? **(b)(5)(ii)(P)**

Is a hammer or wrench prohibited from being used to open cylinder valves?

If valves cannot be opened by hand, is the supplier notified? **(b)(5)(ii)(Q)**

Are workers prohibited from tampering with cylinder valves? If trouble is experienced, is the supplier sent a report promptly indicating the character of the trouble and the cylinder's serial number?

Are supplier's instructions as to its disposition followed? **(b)(5)(ii)(R)(1)**

Is the complete removal of the stem from a diaphragm-type cylinder valve avoided? **(b)(5)(ii)(R)(2)**

Are fuel-gas cylinders placed with valve end up whenever they are in use?

Are liquefied gases stored and shipped with the valve end up? **(b)(5)(iii)(A)**

Are cylinders always handled carefully? **(b)(5)(iii)(B)**

Before connecting a regulator to a cylinder valve, is the valve opened slightly and closed immediately? **(b)(5)(iii)(C)**

Are precautions taken to insure that fuel-gas cylinder valves will not be cracked near welding work or near sparks, flame, or other possible sources of ignition?

Before a regulator is removed from a cylinder valve, is the cylinder valve closed and the gas released from the regulator? **(b)(5)(iii)(D)**

Are precautions taken to insure that nothing is placed on top of an acetylene cylinder when in use that may damage the safety device or interfere with the quick closing of the valve? **(b)(5)(iii)(E)**

If cylinders are found to have leaky valves or fittings which cannot be stopped by closing of the valve, are they taken outdoors away from sources of ignition and slowly emptied? **(b)(5)(iii)(F)**

Are warnings placed near cylinders with leaking fuse plugs or other leaking safety devices not to approach them with a lighted cigarette or other source of ignition? **(b)(5)(iii)(G)**

Are precautions taken to insure that safety devices are not tampered with? **(b)(5)(iii)(H)**

Is fuel-gas prevented from being used from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold? **(b)(5)(iii)(I)**

Is the cylinder valve always opened slowly? **(b)(5)(iii)(J)**

Are precautions taken to insure that an acetylene cylinder valve is not opened more than one and one-half turns of the spindle, and preferably no more than three-fourths of a turn? **(b)(5)(iii)(K)**

Where a special wrench is required, is it left in position on the stem of the valve while the cylinder is in use?

In the case of manifolded or coupled cylinders, is at least one such wrench always available for immediate use? **(b)(5)(iii)(L)**

Manifolding of Cylinders

Fuel-Gas Manifolds

Are manifolds approved either separately for each component part or as an assembled unit? **(c)(1)(i)**

Except as provided in paragraph (c)(1)(iii) of this section, are fuel-gas cylinders connected to one manifold inside a building limited to a total capacity not exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel-gas?

(More than one such manifold with connected cylinders may be located in the same room provided the manifolds are at least 50 feet apart or separated by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour.) **(c)(1)(ii)**

Are fuel-gas cylinders, which are connected to one manifold having an aggregate capacity exceeding 300 pounds of liquefied petroleum gas or 3,000 cubic feet of other fuel-gas, located outdoors, or in a separate building or room constructed in accordance with paragraphs (f)(6)(i)(H) and (f)(6)(i)(I) of this section? **(c)(1)(iii)**

Do separate manifold buildings or rooms used for the storage of drums of calcium carbide and cylinders containing fuel gases comply with paragraph (b)(3) of this section?

Do such buildings or rooms have no open flames for heating or lighting, and are they well-ventilated. **(c)(1)(iv)**

Are high-pressure fuel-gas manifolds provided with approved pressure regulating devices? **(c)(1)(v)**

Are high-pressure oxygen manifolds approved either separately for each component part or as an assembled unit? **(c)(2)(i)**

Are oxygen manifolds prohibited from being located in an acetylene generator room?

Are oxygen manifolds separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet or by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour? **(c)(2)(ii)**

Except as provided in paragraph (c)(2)(iv) of this section, are oxygen cylinders connected to one manifold limited to a total gas capacity of 6,000 cubic feet?

If more than one manifold is connected with cylinders that are located in the same room, is there at least 50 feet distance between manifolds, or are they separated by a noncombustible barrier at least 5 feet high having a fire-resistance rating of at least one-half hour? **(c)(2)(iii)**

Is an oxygen manifold to which cylinders having an aggregate capacity of more than 6,000 cubic feet of oxygen are connected, located outdoors or in a separate, noncombustible building?

If such manifolds are located inside a building used for other occupancies, are they located in a separate room of noncombustible construction having a fire-resistance rating of at least one-half hour or in an area with no combustible material within 20 feet of the manifold? **(c)(2)(iv)**

Do oxygen manifolds or oxygen bulk supply systems which have storage capacity of more than 13,000 cubic feet of oxygen that are connected in service or ready for service, or more than 25,000 cubic feet of oxygen including unconnected reserves on hand at the site, comply with the provisions of the Standard for Bulk Oxygen Systems at Consumer Sites, NFPA No. 566—1965? **(c)(2)(v)**

Are high-pressure oxygen manifolds provided with approved pressure-regulating devices? **(c)(2)(vi)**

Low-Pressure Oxygen Manifolds

Are manifolds of substantial construction suitable for use with oxygen at a pressure of 250 p.s.i.g.?

Do they have a minimum bursting pressure of 1,000 p.s.i.g. and are they protected by a safety relief device which will relieve at a maximum pressure of 500 p.s.i.g.? **(c)(3)(i)**

Do hose and hose connections subject to cylinder pressure comply with paragraph (e)(5) of this section?

Does the hose have a minimum bursting pressure of 1,000 p.s.i.g.? **(c)(3)(ii)**

Has the assembled manifold, including leads, been tested and proven gas-tight at a pressure of 300 p.s.i.g.?

Is the fluid used for testing oxygen manifolds oil-free and not combustible? **(c)(3)(iii)**

Does the location of manifolds comply with paragraphs (c)(2)(ii), (c)(2)(iii), (c)(2)(iv), and (c)(2)(v) of this section? **(c)(3)(iv)**

Is the following sign conspicuously posted at each manifold:

LOW-PRESSURE MANIFOLD DO NOT CONNECT HIGH-PRESSURE CYLINDERS MAXIMUM PRESSURE-250 P.S.I.G. **(c)(3)(v)**

Portable Outlet Headers

Are portable outlet headers prohibited from being used indoors except for temporary service where the condition precludes a direct supply from outlets located on the service piping system? **(c)(4)(i)**

Is each outlet on the service piping, from which oxygen or fuel-gas is withdrawn to supply a portable outlet header, equipped with a readily accessible shutoff valve? **(c)(4)(ii)**

Do hose and hose connection used for connecting the portable outlet header to the service piping comply with paragraph (e)(5) of this section? **(c)(4)(iii)**

Are master shutoff valves for both oxygen and fuel-gas provided at the entry end of the portable outlet header? **(c)(4)(iv)**

Are portable outlet headers for fuel-gas service provided with an approved hydraulic back-pressure valve installed at the inlet and preceding the service outlets, unless an approved pressure-reducing regulators, an approved back-flow check valve, or an approved hydraulic back-pressure valve is installed at each outlet?

(Outlets provided on headers for oxygen service may be fitted for use with pressure-reducing regulators or for direct hose connection.) **(c)(4)(v)**

Is each service outlet on portable outlet headers provided with a valve assembly that includes a detachable outlet seal cap, chained or otherwise attached to the body of the valve? **(c)(4)(vi)**

Do materials and fabrication procedures for portable outlet headers comply with paragraphs (d)(1), (d)(2), and (d)(5) of this section? **(c)(4)(vii)**

Are portable outlet headers provided with frames which will support the equipment securely in the correct operating position and protect it from damage during handling and operation? **(c)(4)(viii)**

Manifold Operation Procedures

Are cylinder manifolds installed under the supervision of someone familiar with the proper practices with reference to their construction and use? **(c)(5)(i)**

Are all manifolds and parts used in methods of manifolding used only for the gas or gases for which they are approved? **(c)(5)(ii)**

When acetylene cylinders are coupled, are approved flash arresters installed between each cylinder and the coupler block? **(c)(5)(iii)**

(**Note:** For outdoor use only, and when the number of cylinders coupled does not exceed three, one flash arrester installed between the coupler block and regulator is acceptable.)

Are precautions taken to ensure that the aggregate capacity of fuel-gas cylinders connected to a portable manifold inside a building does not exceed 3,000 cubic feet of gas? **(c)(5)(iv)**

Are acetylene and liquefied fuel-gas cylinders manifolded in a vertical position? **(c)(5)(v)**

Is the pressure in the gas cylinders connected to and discharged simultaneously through a common manifold approximately equal? **(c)(5)(vi)**

Service Piping Systems

Materials and Design

Do piping and fittings comply with section 2, Industrial Gas and Air Piping Systems, of the American National Standard Code for Pressure Piping ANSI B31.1, 1967, insofar as it does not conflict with paragraphs (d)(1)(i)(A)(1) and (d)(1)(i)(A)(2) of this section? **(d)(1)(i)**

Is pipe at least Schedule 40, and are fittings at least standard weight in sizes up to and including 6-inch nominal? **(d)(1)(i)(A)(1)**

Is copper tubing Types K or L in accordance with the Standard Specification for Seamless Copper Water Tube 4, ASTM B88-66a? **(d)(1)(i)(A)(2)**

Is piping made of steel, wrought iron, brass or copper pipe, or seamless copper, brass or stainless steel tubing, except as provided in paragraphs (d)(1)(ii) and (d)(1)(iii) of this section?

Is oxygen piping and fittings at pressures in excess of 700 p.s.i.g. of be stainless steel or copper alloys? **(d)(1)(ii)(A)**

If hose connections and hose complying with paragraph (e)(5) of this section are used to connect the outlet of a manifold pressure regulator to piping, are they only used when the working pressure of the piping is 250 p.s.i.g., or less, and the length of the hose does not exceed 5 feet?

Does such a hose have a minimum bursting pressure of 1,000 p.s.i.g? **(d)(1)(ii)(B)**

When oxygen is supplied to a service piping system from a low-pressure oxygen manifold without an intervening pressure regulating device, does the piping system have a minimum design pressure of 250 p.s.i.g.?

Is a pressure regulating device used at each station outlet when the connected equipment is for use at pressures less than 250 p.s.i.g.? **(d)(1)(ii)(C)**

Is piping for acetylene or acetylenic compounds made of steel or wrought iron? **(d)(1)(iii)(A)**

Unalloyed copper is prohibited from being used for acetylene or acetylenic compounds except in listed equipment? **(d)(1)(iii)(B)**

Piping Joints

Are joints in steel or wrought iron piping welded, threaded or flanged?

(**Note:** Fittings, such as ells, tees, couplings, and unions, may be rolled, forged or cast steel, malleable iron or nodular iron.)

Are gray or white cast iron fittings prohibited? **(d)(2)(i)**

Are joints in brass or copper pipe welded, brazed, threaded, or flanged?

If of the socket type, are they brazed with silver-brazing alloy or similar high melting point (not less than 800 F (427 C) filler metal? **(d)(2)(ii)**

If joints in seamless copper, brass, or stainless steel tubing are not approved gas tubing fittings or the joints,, are such joints brazed?

Installation

Are distribution lines installed and maintained in a safe operating condition? **(d)(3)(i)**

Is all piping laid underground in earth located below the frost line and protected against corrosion? **(d)(3)(ii)**

After assembly, is piping thoroughly blown out with air, nitrogen, or carbon dioxide to remove foreign materials?

(For oxygen piping, use only oil-free air, oil-free nitrogen, or oil-free carbon dioxide.)

Is only piping which has been welded or brazed installed in tunnels, trenches, or ducts?

Are shutoff valves located outside such conduits?

(Oxygen piping may be placed in the same tunnel, trench or duct with fuel-gas pipelines, provided there is good natural or forced ventilation.) **(d)(3)(iii)**

Are low points in piping carrying moist gas drained into drip pots constructed so as to permit pumping or draining out the condensate at necessary intervals?

Are drain valves installed for this purpose having outlets normally closed with screw caps or plugs?

Are no open end valves or petcocks used (except that in drips located out of doors, underground, and not readily accessible, valves may be used at such points if they are equipped with means to secure them in the closed position)?

Are pipes leading to the surface of the ground cased or jacketed where necessary to prevent loosening or breaking? **(d)(3)(iv)**

Are gas cocks or valves provided for all buildings at points where they will be readily accessible for shutting off the gas supply to these buildings in any emergency?

Is a shutoff valve provided in the discharge line from the generator, gas holder, manifold, or other source of supply? **(d)(3)(v)**

Are shutoff valves prohibited from being installed in safety relief lines in such a manner that the safety relief device can be rendered ineffective? **(d)(3)(vi)**

Are fittings and lengths of pipe examined internally before assembly and, if necessary, freed from scale or dirt?

Is oxygen piping and fittings washed out with a suitable solution which will effectively remove grease and dirt but will not react with oxygen? **(d)(3)(vii)**

(Hot water solutions of caustic soda or trisodium phosphate are effective cleaning agents for this purpose.)

Is piping thoroughly blown out after assembly to remove foreign materials?

For oxygen piping, is oil-free air, oil-free nitrogen, or oil-free carbon dioxide used? **(d)(3)(viii)**

When flammable gas lines or other parts of equipment are being purged of air or gas, are open lights or other sources of ignition not permitted near uncapped openings? **(d)(3)(ix)**

Is welding or cutting prohibited on an acetylene or oxygen pipeline, including the attachment of hangers or supports, until the line has been purged?

Is only oil-free air, oil-free nitrogen, or oil-free carbon dioxide used to purge oxygen lines? **(d)(3)(x)**

Painting and Signs

Are underground pipe and tubing and outdoor ferrous pipe and tubing covered or painted with a suitable material for protection against corrosion? **(d)(4)(i)**

Are above-ground piping systems marked in accordance with the American National Standard Scheme for the Identification of Piping Systems, ANSI A13.1—1956? **(d)(4)(ii)**

Are station outlets marked to indicate the name of the gas? **(d)(4)(iii)**

Testing

Are piping systems tested and proved gas-tight at 1½ times the maximum operating pressure, and are they thoroughly purged of air before being placed in service?

Is the material used for testing oxygen lines oil free and noncombustible?

Are flames prohibited from being used to detect leaks? **(d)(5)(i)**

When flammable gas lines or other parts of equipment are being purged of air or gas, are sources of ignition not permitted near uncapped openings? **(d)(5)(ii)**

Protective Equipment, Hose, and Regulators

Is equipment installed and used only in the service for which it is approved and as recommended by the manufacturer? **(e)(1)**

Pressure Relief Devices

Are service piping systems protected by pressure relief devices set to function at not more than the design pressure of the systems and discharging upwards to a safe location? **(e)(2)**

Piping Protective Equipment

Are Figures Q-1, Q-2, Q-3 (see Appendix) used to determine the protective equipment required in fuel-gas and oxygen piping systems, including portable outlet headers? **(e)(3)(i)**

Is approved protective equipment, design PF, in Figures Q-1, Q-2 and Q-3 installed in fuel-gas piping to prevent: **(e)(3)(ii)**

(A) Backflow of oxygen into the fuel-gas supply system;

(B) Passage of a flashback into the fuel-gas supply system; and

(C) Excessive back pressure of oxygen in the fuel-gas supply system?

(The three functions of the protective equipment may be combined in one device or may be provided by separate devices.)

Is the protective equipment located in the main supply line, as in Figure Q-1 or at the head of each branch line, as in Figure Q-2 or at each location where fuel-gas is withdrawn, as in Figure Q-3? (See Appendix.) **(e)(3)(ii)(1)**

Where branch lines are of 2-inch pipe size or larger or of substantial length, is protective equipment (designated as P_F) located as shown in either Q-2 and Q-3? (See Appendix.)

Is backflow protection provided by an approved device that will prevent oxygen from flowing into the fuel-gas system or fuel from flowing into the oxygen system? **(e)(3)(ii)(2)**

Is flashback protection provided by an approved device that will prevent flame from passing into the fuel-gas system? **(e)(3)(ii)(3)**

Is back-pressure protection provided by an approved pressure-relief device set at a pressure not greater than the pressure rating of the backflow or the flashback protection device, whichever is lower? **(d)(3)(ii)(4)**

Is the pressure-relief device located on the downstream side of the backflow and flashback protection devices?

Is the vent from the pressure-relief device at least as large as the relief device inlet and installed without low points that may collect moisture?

If low points are unavoidable, are drip pots with drains closed with screw plugs or caps installed at the low points?

Are precautions taken to ensure that the vent terminus will not endanger personnel or property through gas discharge, and is it located away from ignition sources, and does it terminate in a hood or bend? **(e)(3)(ii)(4)**

If pipeline protective equipment incorporates a liquid, is the liquid level maintained, and is a suitable antifreeze used to prevent freezing? **(e)(3)(iii)**

Is fuel gas for use with equipment not requiring oxygen withdrawn upstream of the piping protective devices? **(e)(3)(iv)**

Station Outlet Protective Equipment

Is a check valve, pressure regulator, hydraulic seal, or combination of these devices provided at each station outlet, including those on portable headers, to prevent backflow, as shown in Figures Q-1, Q-2, and Q-3 and designated as S_f and S_o? **(e)(4)(i)**

(When approved pipeline protective equipment (designated P_f) is located at the station outlet as in Figure Q-3, no additional check valve, pressure regulator, or hydraulic seal is required.) **(e)(4)(ii)**

YES NO

Is a shutoff valve (designated V_f and V_o) installed at each station outlet and is it located on the upstream side of other station outlet equipment? **(e)(4)(iii)**

If the station outlet is equipped with a detachable regulator, does the outlet terminate in a union connection that complies with the Regulator Connection Standards, 1958, Compressed Gas Association? **(e)(4)(iv)**

If the station outlet is connected directly to a hose, does the outlet terminate in a union connection complying with the Standard Hose Connection Specifications, 1957, Compressed Gas Association? **(e)(4)(v)**

(Station outlets may terminate in pipe threads to which permanent connections are to be made, such as to a machine.) **(e)(4)(vi)**

Are station outlets equipped with a detachable outlet seal cap secured in place?

Is this cap used to seal the outlet except when a hose, a regulator, or piping is attached? **(e)(4)(vii)**

[**Note:** Where station outlets are equipped with approved backflow and flashback protective devices, as many as four torches may be supplied from one station outlet through rigid piping, provided each outlet from such piping is equipped with a shutoff valve and provided the fuel-gas capacity of any one torch does not exceed 15 cubic feet per hour. This paragraph (e)(4)(viii) does not apply to machines.]

Hose and Hose Connections

Do hose for oxy-fuel gas service comply with the Specification for Rubber Welding Hose, 1958, Compressed Gas Association and Rubber Manufacturers Association? **(e)(5)(i)**

When parallel lengths of oxygen and acetylene hose are taped together for convenience and to prevent tangling, are no more than 4 inches out of 12 inches covered by tape? **(e)(5)(ii)**

Do hose connections comply with the Standard Hose Connection Specifications, 1957, Compressed Gas Association? **(e)(5)(iii)**

Are hose connections clamped or otherwise securely fastened in a manner that will withstand leakage at twice the pressure to which they are normally subjected in service, but in no case less than pressure of 300 p.s.i.g.?

Is oil-free air or an oil-free inert gas used for the test? **(e)(5)(iv)**

Are hoses showing leaks, burns, worn places, or other defects repaired or replaced? **(e)(5)(v)**

Pressure-Reducing Regulators

Are pressure-reducing regulators only used for the gas and pressures for which they are intended?

Do the regulator inlet connections comply with Regulator Connection standards, 1958, Compressed Gas Association? **(e)(6)(i)**

When regulators or parts of regulators, including gauges, need repair, is the work performed by skilled mechanics who have been properly instructed? **(e)(6)(ii)**

Gauges on oxygen regulators should be marked: USE NO OIL. **(e)(6)(iii)**

Are union nuts with connections on regulators inspected before use to detect faulty seats which may cause leakage of gas when the regulators are attached to the cylinder valves? **(e)(6)(iv)**

YES NO

Acetylene Generators — Approval and Marking

Are generators of approved construction and plainly marked with the maximum rate of acetylene in cubic feet per hour for which they are designed?

Is the weight and size of carbide necessary for a single charge marked?

Is the manufacturer's name and address, and the name or number of the type of generator marked? **(f)(1)(i)**

Is carbide of the size marked on the generator nameplate? **(f)(1)(ii)**

Rating and Pressure Limitations

Are precautions taken to ensure that the total hourly output of a generator does not exceed the rate for which it is approved and marked?

Unless specifically approved for higher ratings, are carbide-feed generators rated at 1 cubic foot per hour, per pound of carbide, required for a single complete charge? **(f)(2)(i)**

Are relief valves regularly operated to ensure proper functioning?

Are relief valves for generating chambers set to open at a pressure not in excess of 15 p.s.i.g?

Are relief valves for hydraulic back pressure valves set to open at a pressure not in excess of 20 p.s.i.g.? **(f)(2)(ii)**

Are nonautomatic generators are prohibited from being used for generating acetylene at pressures exceeding 1 p.s.i.g., and are all water overflows visible? **(f)(2)(iii)**

Location

Is the space around the generator ample for free, unobstructed operation and maintenance, and does it permit ready adjustment and charging? **(f)(3)**

Stationary Acetylene Generators (Automatic and Nonautomatic)

Is the foundation so arranged that the generator will be level and so that no excessive strain will be placed on the generators or its connections?

Are all acetylene generators grounded? **(f)(4)(i)(A)**

Are generators placed where water will not freeze?

Is the use of common salt (sodium chloride) or other corrosive chemicals for protection against freezing prohibited?

[For heating systems see paragraph (f)(6)(iii) of this section.) **(f)(4)(i)(B)**

Except when generators are prepared in accordance with paragraph (f)(7)(v) of this section, are sources of ignition prohibited in outside generator houses or inside generator room? **(f)(4)(i)(C)**

Is water prohibited from being supplied through a continuous connection to the generator except when the generator is provided with an adequate open overflow or automatic water shutoff which will effectively prevent overfilling of the generator?

Where a noncontinuous connection is used, does the supply line terminate at a point not less than 2 inches above the regularly provided opening for filling so that the water can be observed as it enters the generator? **(f)(4)(i)(D)**

T1

1910.253 — OXYGEN-FUEL GAS WELDING AND CUTTING

YES NO

Unless otherwise specifically approved, are generators prohibited from being fitted with continuous drain connections leading to sewers, but do discharge through an open connection into a suitably vented outdoor receptacle or residue pit which may have such connections?

(**Note:** An open connection for the sludge drawoff is desirable to enable the generator operator to observe leakage of generating water from the drain valve or sludge cock.) **(f)(4)(i)(E)**

Is each generator provided with a vent pipe? **(f)(4)(ii)(A)**

Is the escape or relief pipe rigidly installed without traps and so that any condensation will drain back to the generator? **(f)(4)(ii)(B)**

Is the escape or relief pipe carried full size to a suitable point outside the building?

Does such pipe terminate in a hood or bend located at least 12 feet above the ground, preferably above the roof, and as far away as practicable from windows or other openings into buildings and as far away as practicable from sources of ignition such as flues or chimneys and tracks used by locomotives?

Are generating chamber relief pipes prohibited from being interconnected, and are they required to be separately led to the outside air?

Is the hood or bend so constructed that it will not be obstructed by rain, snow, ice, insects, or birds?

Is the outlet at least 3 feet from combustible construction? **(f)(4)(ii)(C)**

Are gas holders constructed on the gasometer principle, the bell being suitably guided?

Does the gas bell move freely without tendency to bind, and does it have a clearance of at least 2 inches from the shell? **(f)(4)(iii)(A)**

Is a compressor or booster cutoff provided at a point 12 inches or more above the landing point of the bell?

When the gas holder is located indoors, is the room ventilated in accordance with paragraph (f)(6)(ii) of this section and heated and lighted in accordance with paragraphs (f)(6)(iii) and (f)(6)(iv) of this section? **(f)(4)(iii)(B)**

When the gas holder is not located within a heated building, are gas holder seals protected against freezing? **(f)(4)(iii)(C)**

Are means provided to stop the generator-feeding mechanism before the gas holder reaches the upper limit of its travel? **(f)(4)(iii)(D)**

When the gas holder is connected to only one generator, is the gas capacity of the holder not less than one-third of the hourly rating of the generator? **(f)(4)(iii)(E)**

If acetylene is used from the gas holder without increase in pressure at some points but with increase in pressure by a compressor or booster pump at other points, are approved piping protective devices installed in each supply line?

Is the low-pressure protective device located between the gas holder and the shop piping, and is the medium-pressure protective device located between the compressor or booster pump and the shop piping (see Figure Q-4 in Appendix)?

1910.253 — OXYGEN-FUEL GAS WELDING AND CUTTING

YES NO

Is approved protective equipment (designated P_f) used to prevent: backflow of oxygen into the fuel-gas supply stem; passage of a flashback into the fuel-gas supply system; and excessive back pressure of oxygen in the fuel-gas supply system? **(f)(4)(iii)(F)**

Is the compressor or booster system of an approved type? **(f)(4)(iv)(A)**

Does wiring and electrical equipment in compressor or booster pump rooms or enclosures conform to the provisions of Subpart S for Class 1, Division 2 locations? **(f)(4)(iv)(B)**

Are compressors and booster pump equipment located in well-ventilated areas away from open flames, electrical or mechanical sparks, or other ignition sources? **(f)(4)(iv)(C)**

Are compressor or booster pumps provided with pressure relief valves which will relieve pressure exceeding 15 p.s.i.g. to a safe outdoor location as provided in paragraph (f)(4)(ii) of this section, or by returning the gas to the inlet side or to the gas supply source? **(f)(4)(iv)(D)**

Are compressor or booster pump discharge outlets provided with approved protective equipment? [See paragraph (e) of this section.] **(f)(4)(iv)(E)**

Portable Acetylene Generators

Are all portable generators approved for portable use? **(f)(5)(i)(A)**

Are portable generators prohibited from being used within 10 feet of combustible material other than the floor? **(f)(5)(i)(B)**

Are portable generators prohibited from being used in rooms of total volume less than 35 times the total gas-generating capacity per charge of all generators in the room?

Are generators prohibited from being used in rooms having a ceiling height of less than 10 feet? **(f)(5)(i)(C)**

Are portable generators protected against freezing?

Is the use of salt or other corrosive chemical to prevent freezing prohibited? **(f)(5)(i)(D)**

Are portable generators cleaned and recharged and the air mixture blown off outside buildings? **(f)(5)(ii)(A)**

When charged with carbide, are portable generators prohibited from being moved by crane or derrick? **(f)(5)(ii)(B)**

When not in use, are portable generators prohibited from being stored in rooms in which open flames are used, unless the generators contain no carbide and have been thoroughly purged of acetylene?

Are storage rooms well ventilated? **(f)(5)(ii)(C)**

When portable acetylene generators are to be transported and operated on vehicles, and are they securely anchored to the vehicles?

If transported by truck, is the motor turned off during charging, cleaning, and generating periods? **(f)(5)(ii)(D)**

Are portable generators located at a safe distance from the welding position so that they will not be exposed to sparks, slag, or misdirection of the torch flame or overheating from hot materials or processes? **(f)(5)(ii)(E)**

Outside Generator Houses and Inside Generator Rooms for Stationary Acetylene Generators

Is no opening in any outside generator house located within 5 feet of any opening in another building? **(f)(6)(i)(A)**

Are walls, floors, and roofs of outside generator houses of noncombustible construction? **(f)(6)(i)(B)**

When a part of the generator house is to be used for the storage or manifolding of oxygen cylinders, is the space to be occupied separated from the generator or carbide storage section by partition walls continuous from floor to roof or ceiling, of the type of construction stated in paragraph (f)(6)(i)(H) of this section?

Are such separation walls without openings, and are they joined to the floor, other walls and ceiling, or roof in a manner to effect a permanent gas-tight joint? **(f)(6)(i)(C)**

Are exit doors located so as to be readily accessible in case of emergency? **(f)(6)(i)(D)**

Is explosion venting for outside generator houses and inside generator rooms provided in exterior walls or roofs?

Are the venting areas equal to not less than 1 square foot per 50 cubic feet of room volume?

Do they consist of any one or any combination of the following: walls of light, noncombustible material preferably single-thickness; single-strength glass; lightly fastened hatch covers; lightly fastened swinging doors in exterior walls opening outward; lightly fastened walls or roof designed to relieve at a maximum pressure of 25 pounds per square foot? **(f)(6)(i)(E)**

Is the installation of acetylene generators within buildings restricted to buildings not exceeding one story in height; *provided that* this will not be construed as prohibiting such installations on the roof or top floor of a building exceeding such height? **(f)(6)(i)(F)**

Are generators installed inside buildings enclosed in a separate room? **(f)(6)(i)(G)**

Are the walls, partitions, floors, and ceilings of outside generator rooms of noncombustible construction having a fire-resistance rating of at least 1 hour?

Are the walls or partitions continuous from floor to ceiling and are they securely anchored?

Is at least one wall of the room an exterior wall? **(f)(6)(i)(H)**

Are openings from an inside generator room to other parts of the building protected by a swinging type, self-closing fire door for a Class B opening and having a rating of at least 1 hour?

Do windows in partitions have wired glass and approved metal frames with fixed sash?

Is installation done in accordance with the Standard for Installation of Fire Doors and Windows, NFPA 80 — 1970? **(f)(6)(i)(I)**

Are inside generator rooms or outside generator houses well ventilated with vents located at floor and ceiling level? **(f)(6)(ii)**

Is heating done with steam, hot water, enclosed electrically heated elements, or other indirect means?

Is heating by flames or fires prohibited in outside generator houses or inside generator rooms, or in any enclosure communicating with them? **(f)(6)(iii)**

Do generator houses or rooms have natural light during daylight hours?

Where artificial lighting is necessary, is it restricted to electric lamps installed in a fixed position?

Unless specifically approved for use in atmospheres containing acetylene, are such lamps provided with enclosures of glass or other noncombustible material so designed and constructed as to prevent gas vapors from reaching the lamp or socket and to resist breakage?

Are rigid conduit with threaded connections used? **(f)(6)(iv)(A)**

(**Note:** Lamps installed outside of wired-glass panels set in gas-tight frames in the exterior walls or roofs of the generator house or room are acceptable.) **(f)(6)(iv)(B)**

Are electrical apparatus which may cause a spark, unless specifically approved for use inside acetylene generator rooms, located outside the generator house or in a room or space separated from the generator room by a gas-tight partition, except that where the generator system is designed so that no carbide fill opening or other part of the generator is open to the generator house or room during the operation of the generator?

Does electrical equipment in the generator house or room conform to the provisions of Subpart S for Class I, Division 2 locations. **(f)(6)(v)**

Maintenance and Operation

Are unauthorized persons prohibited from entering outside generator houses or inside generator rooms? **(f)(7)(i)**

Are operating instructions posted in a conspicuous place near the generator or kept in a suitable place available for ready reference? **(f)(7)(i)(A)**

When recharging generators, is the order of operations specified in the manufacturer's instructions followed? **(f)(7)(i)(B)**

In the case of batch-type generators, when the charge of carbide is exhausted and before additional carbide is added, is the generating chamber be flushed out with water, renewing the water supply in accordance with the instruction card furnished by the manufacturer? **(f)(7)(i)(C)**

Is the water-carbide residue mixture drained from the generator prohibited from being discharged into sewer pipes or stored in areas near open flames?

(Clear water from residue settling pits may be discharged into sewer pipes.) **(f)(7)(i)(D)**

Is the carbide added each time the generator is recharged sufficient to refill the space provided for carbide without ramming the charge?

Is steel or other ferrous prohibited from being used in distributing the charge? **(f)(7)(ii)**

Are generator water chambers kept filled to proper level at all times except while draining during the recharging operation? **(f)(7)(iii)**

Whenever repairs are to be made or the generator is to be charged or carbide is to be removed, is the water chamber filled to the proper level? **(f)(7)(iv)**

Previous to making repairs involving welding, soldering, or other hot work, is the carbide charge and feed mechanism completely removed?

Is all acetylene expelled by completely flooding the generator with water, and is the generator disconnected from the piping system?

Is the generator kept filled with water, if possible, or positioned to hold as much water as possible? **(f)(7)(v)**

Are hot repairs prohibited from begin made in a room where there are other generators unless all the generators and piping have been purged of acetylene? **(f)(7)(vi)**

Calcium Carbide Storage

Packaging

Is calcium carbide contained in metal packages of sufficient strength to prevent rupture?

Are the packages provided with a screw top or equivalent?

Are these packages water-and air-tight?

Is solder prohibited from being used in such a manner that the package would fail if exposed to fire? **(g)(1)(i)**

Are packages containing calcium carbide conspicuously marked: CALCIUM CARBIDE — DANGEROUS IF NOT KEPT DRY, or with equivalent warning? **(g)(1)(ii)**

CAUTION: METAL TOOLS, EVEN THE RESISTANT TYPE MAY CAUSE IGNITION OF AN ACETYLENE AND AIR MIXTURE WHEN OPENING CARBIDE CONTAINERS. **(g)(1)(iii)**

Are sprinkler systems prohibited from being installed in carbide storage rooms? **(g)(1)(iv)**

Storage Indoors

(Calcium carbide in quantities not to exceed 600 pounds may be stored indoors in dry, waterproof, and well-ventilated locations.) **(g)(2)(i)**

(Calcium carbide not exceeding 600 pounds may be stored indoors in the same room with fuel-gas cylinders.) **(g)(2)(i)(A)**

Are packages of calcium carbide, except for one of each size, kept sealed?

Are the seals prohibited from being broken when there is carbide in excess of 1 pound in any other unsealed package of the same size of carbide in the room? **(g)(2)(i)(B)**

Is calcium carbide exceeding 600 pounds but not exceeding 5,000 pounds stored: **(g)(2)(ii)(A-C)**

In accordance with paragraph (g)(2)(iii) of this section;

In an inside generator room or outside generator house; or

In a separate room in a one-story building which may contain other occupancies, but without a cellar or basement beneath the carbide storage section?

Are such rooms constructed in accordance with paragraphs (f)(6)(i)(H) and (f)(6)(i)(I) of this section and ventilated in accordance with paragraph (f)(6)(ii) of this section?

Are these rooms prohibited from being used for no other purpose?

Is calcium carbide in excess of 5,000 pounds stored in one-story buildings without cellar or basement and used for no other purpose, or in outside generator houses?

[**Note**: If the storage building is of noncombustible construction, it may adjoin other one-story buildings if separated by unpierced firewalls; if it is detached less than 10 feet from such building or buildings, there should be no opening in any of the mutually exposing sides of such buildings within 10 feet. If the storage building is of combustible construction, it must be at least 20 feet from any other one or two-story building, and at least 30 feet from any other building exceeding two stories.]

Storage Outdoors

(Calcium carbide in unopened metal containers may be stored outdoors.) **(g)(3)(i)**

Are carbide containers to be stored outdoors examined to make sure that they are in good condition?

Are periodic reexaminations made for rusting or other damage to a container that might affect its water or air tightness? **(g)(3)(ii)**

Is the bottom tier of each row placed on wooden planking or equivalent, so that the containers will not come in contact with the ground or ground water? **(g)(3)(iii)**

Are containers of carbide which have been in storage the longest always used first? **(g)(3)(iv)**

1910.254 — ARC WELDING AND CUTTING

General

Equipment Selection

Is welding equipment chosen for safe application to the work to be done as specified in paragraph (b) of this section? **(a)(1)**

Installation

Is welding equipment installed safely as specified by paragraph (c) of this section? **(a)(2)**

Instruction

Have workers who are designated to operate arc welding equipment been properly instructed, and are they qualified to operate such equipment as specified in paragraph (d) of this section? **(a)(3)**

Application of Arc Welding Equipment

[**Note**: Assurance of consideration of safety in design can be obtained by choosing apparatus complying with the Requirements for Electric Arc-Welding Apparatus, NEMA EW—1—1962, National Electrical Manufacturers Association or the Safety Standard for Transformer-Type Arc-Welding Machines, ANSI C33.2—1956, Underwriters' Laboratories.] **(b)(1)**

Environmental Conditions

Are standard machines for arc welding service designed and constructed to carry their rated load with rated temperature rises where the temperature of the cooling air does not exceed 40° C (104° F) and where the altitude does not exceed 3,300 feet, and are they suitable for operation in atmospheres containing gases, dust, and light rays produced by the welding arc? **(b)(2)(i)**

In unusual service conditions, are machines designed to safely meet the requirements of the service? Chief among these conditions are: **(b)(2)(ii)**

(A) Exposure to unusually corrosive fumes.

(B) Exposure to steam or excessive humidity.

(C) Exposure to excessive oil vapor.

(D) Exposure to flammable gases.

(E) Exposure to abnormal vibration or shock.

(F) Exposure to excessive dust.

(G) Exposure to weather.

(H) Exposure to unusual seacoast or shipboard conditions.

Voltage

Are precautions taken to ensure that the following limits are not exceeded: **(b)(3)**

Alternating-current machines

Manual arc welding and cutting—80 volts.

Automatic (machine or mechanized) arc welding and cutting—100 volts **(b)(3)(i)(A-B)**

Direct-current machines

Manual arc welding and cutting—100 volts.

Automatic (machine or mechanized) arc welding and cutting—100 volts. **(b)(3)(ii)(A-B)**

When special welding and cutting processes require values of open circuit voltages higher than the above, are means provided to prevent the operator from making accidental contact with the high voltage by adequate insulation or other means? **(b)(3)(iii)**

[For a.c. welding under wet conditions or warm surroundings where perspiration is a factor, the use of reliable automatic controls for reducing no load voltage is recommended to reduce the shock hazard.] **(b)(3)(iv)**

Design

[A controller integrally mounted in an electric motor driven welder must have capacity for carrying rated motor current; be capable of making and interrupting stalled rotor current of the motor; and may serve as the running overcurrent device if provided with the number of overcurrent units as specified by Subpart S.] **(b)(4)(i)**

On all types of arc welding machines, are control apparatus enclosed except for the operating wheels, levers, or handles? **(b)(4)(ii)**

Are input power terminals, tap change devices and live metal parts connected to input circuits completely enclosed and accessible only by means of tools? **(b)(4)(iii)**

Are terminals for welding leads protected from accidental electrical contact by personnel or by metal objects? **(b)(4)(iv)**

Are precautions taken to ensure that no connections for portable control devices to be carried by the operator, are connected to an a.c. circuit of higher than 120 volts?

Are exposed metal parts of portable control devices operating on circuits above 50 volts grounded by a grounding conductor in the control cable? **(b)(4)(v)**

Are precautions taken to ensure that no auto transformers or a.c. reactors are used to draw welding current directly from any a.c. power source having a voltage exceeding 80 volts? **(b)(4)(vi)**

Installation of Arc Welding Equipment

Is installation including power supply performed in accordance with the requirements of Subpart S? **(c)(1)**

Grounding

Is the frame or case of the welding machine (except engine-driven machines) grounded under the conditions and according to the methods prescribed in Subpart S? **(c)(2)(i)**

Are conduits containing electrical conductors prohibited from being used for completing a work-lead circuit?

Are pipelines prohibited from being used as a permanent part of a work lead-circuit, but may be used during construction, extension or repair providing current is carried through threaded joints, flanged bolted joints, or caulked joints and that special precautions are used to avoid sparking at connection of the work-lead cable? **(c)(2)(ii)**

Are chains, wire ropes, cranes, hoists, and elevators prohibited from being used to carry welding current? **(c)(2)(iii)**

Where a structure, conveyor, or fixture is regularly employed as a welding current return circuit, are joints bonded or provided with adequate current collecting devices? **(c)(2)(iv)**

Are all ground connections checked to determine that they are mechanically strong and electrically adequate for the required current? **(c)(2)(v)**

Supply Connections and Conductors

Is a disconnecting switch or controller provided at or near each welding machine which is not equipped with such a switch or controller mounted as an integral part of the machine?

Is the switch in accordance with Subpart S?

Is overcurrent protection provided as specified in Subpart S?

Is a disconnect switch with overload protection, or equivalent disconnect and protection means (permitted by Subpart S), provided for each outlet intended for connection to a portable welding machine? **(c)(3)(i)**

For individual welding machines, is the rated current-carrying capacity of the supply conductors not less than the rated primary current of the welding machines? **(c)(3)(ii)**

(For groups of welding machines, the rated current-carrying capacity of conductors may be less than the sum of the rated primary currents of the welding machines supplied.)

Is the conductor rating determined in each case according to the machine loading based on the use to be made of each welding machine and the allowance permissible in the event that all the welding machines supplied by the conductors will not be in use at the same time? **(c)(3)(iii)**

[**Note:** In operations involving several welders on one structure, d.c. welding process requirements may require the use of both polarities; or supply circuit limitations for a.c. welding may require distribution of machines among the phases of the supply circuit. In such cases no load voltages between electrode holders will be 2 times normal in d.c. or 1,1.41, 1.73, or 2 times normal on a.c. machines. Similar voltage differences will exist if both a.c. and d.c. welding are done on the same structure.] **(c)(3)(iv)**

Are all d.c. machines connected with the same polarity? **(c)(3)(iv)(A)**

Are all a.c. machines connected to the same phase of the supply circuit and with the same instantaneous polarity? **(c)(3)(iv)(B)**

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1910.254 — ARC WELDING AND CUTTING

YES NO

Operation and Maintenance

Are workers assigned to operate or maintain arc welding equipment acquainted with the requirements of this section and with 1910.252 (a),(b), and (c)?

If doing gas-shielded arc welding, are workers familiar with Recommended Safe Practices for Gas-Shielded Arc Welding, A6.1—1966, American Welding Society? **(d)(1)**

Machine Hook Up

Before starting operations, are all connections to the machine checked to make certain they are properly made?

Is the work lead firmly attached to the work?

Is the magnetic work clamp freed from adherent metal particles of spatter on contact surfaces?

Is the coiled welding cable spread out before use to avoid serious overheating and damage to insulation? **(d)(2)**

Grounding

Is grounding of welding machine frame checked, and is special attention given to safety connections of portable machines? **(d)(3)**

Leaks

Are precautions taken to make sure that there are no leaks of cooling water, shielding gas, or engine fuel? **(d)(4)**

Switches

Is proper switching equipment for shutting down the machine provided? **(d)(5)**

Manufacturers' Instructions

Are the printed rules and instructions covering operation of equipment supplied by the manufacturers strictly followed? **(d)(6)**

Electrode Holders

When not in use, are electrode holders placed so that they cannot make electrical contact with persons, conducting objects, fuel or compressed gas tanks? **(d)(7)**

Electric Shock

Are cables with splices within 10 feet (3 m) prohibited from being used?

Is the welder prohibited from coiling or looping the welding electrode cable around parts of his body? **(d)(8)**

Maintenance

Does the operator report any equipment defects or safety hazards to his or her supervisor, and is the use of the equipment discontinued until its safety has been assured?

Are repairs only made by qualified personnel? **(d)(9)(i)**

Are machines which have become wet thoroughly dried and tested before being used? **(d)(9)(ii)**

Are cables with damaged insulation or exposed bare conductors replaced?

Are joining lengths of work and electrode cables done by the use of connecting means specifically intended for the purpose?

Does the connecting means have insulation adequate for the service conditions? **(d)(9)(iii)**

1910.255 — RESISTANCE WELDING

YES NO

Installation

Is all equipment installed by a qualified electrician in conformance with Subpart S?

Is there a safety-type disconnecting switch or a circuit breaker or circuit interrupter to open each power circuit to the machine, conveniently located at or near the machine, so that the power can be shut off when the machine or its controls are to be serviced? **(a)(1)**

Thermal Protection

Are ignition tubes used in resistance welding equipment equipped with a thermal protection switch? **(a)(2)**

Personnel

Are workers designated to operate resistance welding equipment properly instructed and judged competent to operate such equipment? **(a)(3)**

Guarding

Are controls of all automatic or air and hydraulic clamps arranged or guarded to prevent the operator from accidentally activating them? **(a)(4)**

Spot and Seam Welding Machines (nonportable)

Voltage

Do all external weld initiating control circuits operate on low voltage, not over 120 volts, for the safety of the operators? **(b)(1)**

Capacitor Welding

Is stored energy or capacitor discharge type of resistance welding equipment and control panels involving high voltage (over 550 volts) suitably insulated and protected by complete enclosures?

Are all doors provided with suitable interlocks and contacts wired into the control circuit (similar to elevator interlocks)?

Are such interlocks or contacts designed to effectively interrupt power and short circuit all capacitors when the door or panel is open?

Is a manually operated switch or suitable positive device installed, in addition to the mechanical interlocks or contacts, as an added safety measure assuring absolute discharge of all capacitors? **(b)(2)**

Interlocks

Are all doors and access panels of all resistance welding machines and control panels kept locked and interlocked to prevent access by unauthorized persons? **(b)(3)**

Guarding

Are all press welding machine operations, where there is a possibility of the operator's fingers being under the point of operation, effectively guarded by the use of a device such as an electronic eye safety circuit, two hand controls, or protection similar to that prescribed for punch press operation, 1910.217?

Are all chains, gears, operating bus linkage, and belts protected by adequate guards, in accordance with 1910.219? **(b)(4)**

Shields

Where practicable, is the hazard of flying sparks eliminated by installing a shield guard of safety glass or suitable fire-resistant plastic at the point of operation?

1910.255 — RESISTANCE WELDING

YES NO

Are additional shields or curtains installed as necessary to protect passing persons from flying sparks? [See 1910.252(b)(2)(i)(C).] **(b)(5)**

Foot Switches

Are all foot switches guarded to prevent accidental operation of the machine? **(b)(6)**

Stop Buttons

Are two or more safety emergency stop buttons provided on all special multi-spot welding machines, including 2-post and 4-ost weld presses? **(b)(7)**

Safety Pins

On large machines, are four safety pins with plugs and receptacles (one in each corner) provided so that when safety pins are removed and inserted in the ram or platen, the press becomes inoperative? **(b)(8)**

Grounding

Where technically practical, is the secondary of all welding transformers, used in multi-spot, projection, and seam welding machines, grounded?

[**Note:** This may be done by permanently grounding one side of the welding secondary current circuit. Where not technically practical, a center tapped grounding reactor connected across the secondary or the use of a safety disconnect switch in conjunction with the welding control are acceptable alternates.]

Is a safety disconnect arranged to open both sides of the line when welding current is not present? **(b)(9)**

Portable Welding Machines

Counterbalance

Do are all portable welding guns have suitable counterbalance devices for supporting the guns including cables, unless the design of the gun or fixture makes counterbalancing impractical or unnecessary? **(c)(1)**

Safety Chains

Are all portable welding guns, transformers, and related equipment that is suspended from overhead structures, eye beams, trolleys, etc., equipped with safety chains or cables?

Are safety chains or cables capable of supporting the total shock load in the event of failure of any component of the supporting system? **(c)(2)**

Clevis

Is each clevis capable of supporting the total shock load of the suspended equipment in the event of trolley failure? **(c)(3)**

Switch Guards

Are all initiating switches, including retraction and dual schedule switches, located on the portable welding gun, and are they equipped with suitable guards capable of preventing accidental initiation through contact with fixturing, operator's clothing, etc.?

Is the initiating switch voltage prevented from exceeding 24 volts? **(c)(4)**

1910.255 — RESISTANCE WELDING

YES NO

Moving Holder

Does the movable holder, where it enters the gun frame, have sufficient clearance to prevent the shearing of fingers carelessly placed on the operating movable holder? **(c)(5)**

Grounding

Is the secondary and case of all portable welding transformers grounded?

(Secondary grounding may be by center tapped secondary or by a center tapped grounding reactor connected across the secondary.) **(c)(6)**

Flash Welding Equipment

Ventilation Anti-Flash Guard

Are flash welding machines equipped with a hood to control flying flash?

In cases of high production, where materials may contain a film of oil and where toxic elements and metal fumes are given off, is ventilation provided in accordance with 1910.252(c)? **(d)(1)**

Fire Curtains

For the protection of the operators of nearby equipment, are fire-resistant curtains or suitable shields set up around the machine and in such a manner that the operators' movements are not hampered? **(d)(2)**

Maintenance

Is a periodic inspection made by qualified maintenance personnel, and a certification record maintained?

Does the certification record include the date of inspection, the signature of the person who performed the inspection, and the serial number or other identifier for the equipment inspected?

Is the operator instructed to report any equipment defects to his or her supervisor, and the use of the equipment discontinued until safety repairs have been completed? **(e)**

1910.256 — SOURCES OF STANDARDS

Sec.	Source
1910.251	ANSI Z49.1—1967, Safety in Welding and Cutting
1910.252-.255	(a) NFPA—51—1969, Welding and Cutting Oxygen Fuel Gas System. (b) ANSI Z—49.1—1967, Safety in Welding and Cutting. (c) NFPA—51B—1962, Cutiing and Welding Processes. (d) 41 CFR 50-204.7.

1910.257 — STANDARDS ORGANIZATIONS

YES	NO

Specific standards of the following organizations have been referenced in this Subpart. Copies of the referenced standards may be obtained from the issuing organizations. The names and addresses of the issuing organizations are as follows:

American National Standards Institute (ANSI), 1430 Broadway, New York, NY 10018.

National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Compressed Gas Association, Inc., 1235 Jefferson Davis Highway, Arlington, VA 22207.

American Petroleum Institute, 1220 L Street NW., Washington, DC 20005.

American Welding Society, 550 N W. LeJeune Road, P.O. Box 351040, Miami, FL 33135.

Rubber Manufacturers Association, 1400 K Street NW., Washington, DC 20005.

[FR Doc. 90—7799 Filed 4-10-90; 1910.251-.257; Revised May 11, 1990.]

YES	NO

T1

PIPING PROTECTIVE EQUIPMENT

LEGEND

P_F— Protective equipment in fuel gas piping
V_F—Fuel gas station outlet valve
V_O—Oxygen station outlet valve
S_F—Backflow prevention device(s) at fuel gas station outlet
S_O—Backflow prevention device(s) at oxygen station outlet

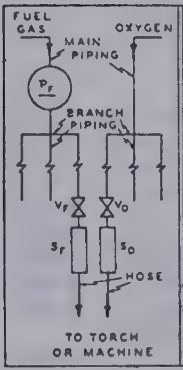

FIGURE Q-1

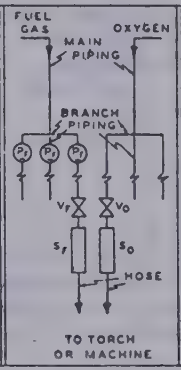

FIGURE Q-2

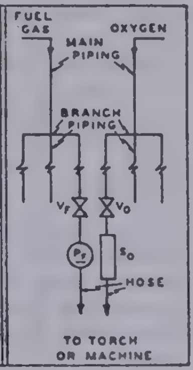

FIGURE Q-3

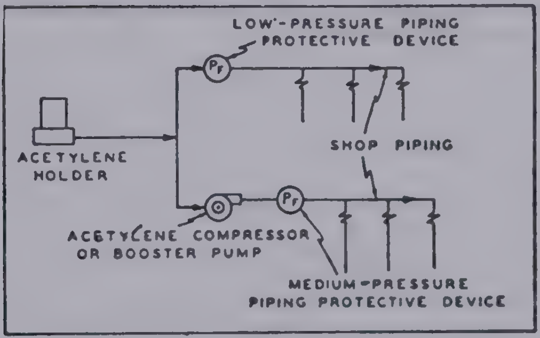
LOW-PRESSURE PIPING PROTECTIVE DEVICE
P_F
SHOP PIPING
ACETYLENE HOLDER
P_F
ACETYLENE COMPRESSOR OR BOOSTER PUMP
MEDIUM-PRESSURE PIPING PROTECTIVE DEVICE

FIGURE Q-4

Shade Selection Guide for Eye Protection Filters and Lenses

1910.252(e)(2)(ii)(i)

Welding operation	*Shade No.*
Shielded metal-arc welding—1/16-, 3/32-, ⅛-, 5/32-inch electrodes	10
Gas-shielded arc welding (nonferrous)—1/16-, 3/32-, ⅛-, 5/32-inch electrodes	11
Gas-shielded arc welding (ferrous)—1/16-, 3/32-, ⅛-, 5/32-inch electrodes	12
Shielded metal-arc welding:	
3/16-, 7/32-, ¼-inch electrodes	12
5/16-, ⅜-inch electrodes	14
Atomic hydrogen welding	10–14
Carbon arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to ⅛ inch	4 or 5
Gas welding (medium) ⅛ inch to ½ inch	5 or 6
Gas welding (heavy,) ½ inch and over	6 or 8

NOTE: In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter or lens that absorbs the yellow or sodium line in the visible light of the operation.

OVERVIEW: SUBPART R

SPECIAL INDUSTRIES

This subpart contains specific requirements applicable only to eight special industries: pulp, paper, and paperboard mills; textiles; bakeries; laundries; sawmills; pulpwood logging operations; telecommunications; and grain handling facilities.

Pulp, paper, and paperboard mills, 1910.261, applies to the manufacture or conversion of pulp, paper, and paperboard, but not to logging or log transport.* This section contains requirements for employee protection, materials handling and storage, machine guarding, and safe operating procedures.

Textiles, 1910.262, applies to the manufacture and processing of textiles, except for exclusive manufacture or processing of synthetics. Machine guarding equipment specifications, employee protection, first aid, and ventilation are covered.

Bakery equipment, 1910.263, applies to all machinery and equipment used in bakeries, and includes requirements for machine guarding, materials handling and storage, and safety devices.

Laundry machinery and operations, 1910.264, applies to all equipment used in laundries that has moving parts; and includes requirements for point-of-operation guards, safety devices, and employee training. Dry cleaning operations are not covered in this specific section.

Sawmills, 1910.265, applies to all sawmill operations except the manufacture of plywood, cooperage, and veneer. This section contains requirements for sawmill design, housekeeping, ventilation, lighting, employee protection, machine and equipment guarding, materials handling and storage, and vehicles.

Pulpwood logging, 1910.266, applies to all pulpwood logging operations except those related to sawlogs, veneer bolts, poles, and piling. Included are requirements for employee protection and first aid, tools, work areas, weather considerations, safe operation of equipment and machinery, protective devices, and materials handling and transport.

Although agricultural operations requirements were transferred to 1928.21 and are no longer part of the general industry standards, some basic requirements have been retained in this checklist. Also note that OSHA's field sanitation standard (1928.110) appears in Subpart J.

Telecommunications, 1910.268, applies to telecommunications centers and field installations, except those owned, operated, and controlled exclusively by electric utilities. Requirements for work areas, equipment and machine guarding, hazardous materials, employee training, personal protection, first aid, tools, climbing equipment and ladders, vehicles, materials handling and storage, and grounding are included.

Grain handling facilities, 1910.272, applies to grain elevators, feed mills, flour mills, rice mills, dust pelletizing plants, dry corn mills, soybean flaking operations, and the dry grinding operations of soycake.

Specific sections of the standards in the checklist:

Std. No.		Page No.
1910.261	**Pulp, paper, and paperboard mills**	R-01
1910.262	**Textiles**	R-12
1910.263	**Bakery equipment**	R-16
1910.264	**Laundry machinery and operations**	R-22
1910.265	**Sawmills**	R-22
1910.266	**Pulpwood logging**	R-32
1910.267	**Agricultural operations**	R-36
1910.268	**Telecommunications**	R-36
1910.272	**Grain handling facilities**	R-47

*Note: For logging and log transport, see 1910.266, Pulpwood logging.

DEFINITIONS — SUBPART R

Definitions applicable to 1910.262, Textiles:

Belt shifter. A device for mechanically shifting a belt from one pulley to another.

Belt shifter lock. A device for positively locking the belt shifter in position while the machine is stopped and the belt is idling on the loose pulleys.

Calender. A set of heavy rollers mounted on vertical side frames and arranged to pass cloth between them.

Cans (drying). Hollow, cylindrical drums mounted in a frame so they can rotate. They are heated with steam and are used to dry fabrics or yarn as it passes around the perimeter of the can.

Carbonizing. The removing of vegetable matter such as burns, straws, etc., from wool by treatment with acid, followed by heat.

Card. Cylinders of various sizes—and in certain cases flats—covered with card clothing and set in relation to each other so that fibers in staple form may be separated into individual relationship.

Card clothing. The material with which many of the surfaces of a card are covered; e.g., the cylinder, doffer, etc. It consists of a thick foundation material, usually made of textile fabrics, through which are pressed many fine, closely spaced, specially bent wires.

Comber. A machine for combing fibers of cotton, wool, etc.

Combing machinery. A general classification, including combers, sliver lap machines, ribbon lap machines, and gill boxes, but excluding cards.

Cutter (rotary staple). A machine consisting of one or more rotary blades used for the purpose of cutting textile fibers into staple lengths.

Embossing calender. A calender with two or more rolls, one of which is engraved for producing figured effects of various kinds on a fabric.

Exposed to contact. When the location of an object, material, nip point, or point of operation is such that a person is liable to come in contact with it in the normal course of employment.

Garnett machine. Any of a number of types of machines for opening hard twisted waste of wool, cotton, silk, etc.

Gill box. A machine used in the worsted system of manufacturing yarns to arrange the fibers in parallel order.

Interlock. A device that operates to prevent the operation of machine while the cover or door of the machine is open or unlocked, and which will also hold the cover or door closed and locked while the machine is in motion.

Jig (dye). A machine for dyeing piece goods. The cloth, at full width, passes from a roller through the dye liquor in an open vat and is then wound on another roller. The operation is repeated until the desired shade is obtained.

Kier. A large metal vat, usually a pressure type, in which fabrics may be boiled out, bleached, etc.

Lapper (ribbon). A machine used to prepare laps for feeding a cotton comb; its purpose is to provide a uniform lap in which the fibers have been straightened as much as possible.

Lapper (sliver). A machine in which a number of parallel card slivers are drafted slightly, laid side by side in a compact sheet, and wound into a cylindrical package.

Loom. A machine for effecting the interlacing of two series of yarns crossing one another at right angles. The warp yarns are wound on a warp beam and pass through heddles and reed. The filling is shot across in a shuttle and settled in place by reed and lay, and the fabric is wound on a cloth beam.

Mangle (starch). A mangle used specifically for starching cotton goods, commonly consisting of two large rolls and a shallow open vat with several immersion rolls. The vat contains the starch solution.

Mangle (water). A calender having two or more rolls used for squeezing water from fabrics before drying. Water mangles also may be used in other ways during the finishing of various fabrics.

Mule. A type of spinning frame having a head stock and a carriage as its two main sections. The head stock is stationary. The carriage is movable and carries the spindles which draft and spin the roving into the yarn.

Nip. The point of contact between two in-running rolls.

Openers and pickers. A general classification which includes breaker pickers, intermediate pickers, finisher pickers, single process pickers, multiple process pickers, willow machines, card and picker waste cleaners, thread extractors, shredding machines, roving waste openers, shoddy pickers, bale breakers, feeders, vertical openers, lattice cleaners, horizontal cleaners, and any similar machinery equipped with either cylinders, screen section, calender section, rolls, or beaters used for the preparation of stock for further processing.

Paddler. A trough for a sollution and two or more squeeze rolls between which cloth passes after being passed through a mordant or dye bath.

Point of operation. That part of the machine where the work of cutting, shearing, squeezing, drawing, or manipulating the stock in any other way is done.

Printing machine (roller type). A machine consisting of a large central cylinder, or pressure bowl, around the lower part of the perimeter of which is placed a series of engraved color rollers (each having a color trough), a furnisher roller, doctor blades, etc. The machine is used for printing fabrics.

Ranges (bleaching continuous). These may be made for cloth in rope or open-width form. The goods, after wetting out, pass through a squeeze roll into a saturator containing a solution of casutic soda and then to an enclosed J-box. A V-shaped arrangement is attached to the front part of the J-box for uniform and rapid saturation of the cloth with steam before it is packed down in the J-box. The cloth, in a single strand rope form, passes over a guide roll down the first arm of the "V" and up the second. Steam is injected into the "V" at the upper end of the second arm so that the cloth is rapidly saturated with steam at this point.The J-box capacity is such that cloth will remain hot for a sufficient time to complete the scouring action. It then passes a series of washers with a squeeze roll in between. The cloth then passes through a second set of saturator, J-box, and washer, where it is treated with the peroxide solution. By slight modification of the form of the unit, the same process can be applied to open-width cloth.

Range (mercerizing). A 3-bowl mangle, a tenter frame, and a number of boxes for washing and scouring in a straight line and operating continuously. The combination is used to saturate the cloth with sodium hydroxide, stretch it while saturated, and wash out most of the caustic before releasing tension.

Sanforizing machine. A machine consisting of a large steam-heated cylinder, an endless, thick woolen felt blanket which is in close contact with the cylinder for most of its perimeter, and an electrically heated shoe which presses the cloth against the blanket while the latter is in a stretched condition as it curves around feed-in roll.

Shearing machine. A machine used in shearing cloth. Cutting action is provided by a number of steel blades spirally mounted on a roller. The roller rotates in close contact with a fixed ledger blade.

Singeing machine. A machine used particularly with cotton; consisting of a heated roller, plate, or an open gas flame. The material is rapidly passed over the roller or the plate or through the open gas flame to remove fuzz or hairiness on yarn or cloth by burning.

Slasher. A machine used for applying a size mixture to warp yarns.

Solvent (industrial organic). Any organic volatile liquid or compound, or any combination of these substances which is used to dissolve or suspend a nonvolatile or slightly volatile substance for industrial utilization.

Tenter frame. A machine for drying cloth under tension.

Warper. Any machine for preparing and arranging the yarns intended for the warp of a fabric, specifically, a beam warper.

Definitions applicable to 1910.265, Sawmills:

A-frame. A structure made of two independent columns fastened together at the top and separated at the bottom for stability.

Annealing. Heating then cooling to soften and render less brittle.

Binder. A chain, cable, rope, or other approved material used for binding loads.

Boom. Logs or timbers fastened together end to end and used to contain floating logs. The term includes enclosed logs.

Brow log. A log placed parallel to a roadway at a landing or dump to protect vehicles while loading or unloading.

Bunk. A cross support for a load.

Cant. A log slabbed on one or more sides.

Carriage (log carriage). A framework mounted on wheels which runs on tracks or in grooves in a direction parallel to the face of the saw, and which contains apparatus to hold a log securely and advance it towards the saw.

Carrier. An industrial truck so designed and constructed that it straddles the load to be transported with mechanisms to pick up the load and support it during transportation.

Chipper. A machine which cuts material into chips.

Chock (bunk block) (cheese block). A wedge that prevents logs or loads from moving.

Cold deck. A pile of logs stored for future removal.

Crotch lines. Two short lines attached to a hoisting line by a ring or shackle, the lower ends being attached to loading hooks.

Dog (carriage dog). A steel tooth, one or more of which are attached to each carriage knee to hold log firmly in place on carriage.

Drag saw. A power-driven, reciprocating crosscut saw mounted on suitable frame and used for bucking logs.

Head block. That part of a carriage which holds the log and upon which it rests.

Head rig. A combination of head saw and log carriage used for the initial breakdown of logs into timbers, cants, and boards.

Hog. A machine for cutting or grinding slabs and other coarse residue from the mill.

Husk. A head saw framework on a circular mill.

Industrial truck. A mobile power-driven truck or tractor.

Kiln tender. The operator of a kiln.

Lift truck. An industrial truck used for lateral transportation and equipped with a power-operated lifting device, usually in the form of forks, for piling or unpiling lumber units or packages.

Live rolls. Cylinders or wood or metal mounted on horizontal axes and rotated by power, which are used to convey slabs, lumber, and other wood products.

Loading boom. Any structure projecting from a pivot point to guide a log when lifted.

Log deck. A platform in the sawmill on which the logs remain until needed for sawing.

Log haul. A conveyor for transferring logs in mill.

Lumber hauling truck. An industrial truck, other than a lift truck or a carrier, used for the transport of lumber.

Package. A unit of lumber.

Peavy. A stout wooden handle fitted with a spike and hook and used for rolling logs.

Pike pole. A long pole whose end is shod with a sharp pointed spike.

Pitman rod. Connecting rod.

Resaw. Band, circular, or sash gang saws used to break down slabs, cants, or flitches into lumber.

Running line. Any moving rope as distinguished from a stationary rope such as a guyline.

Safety factor. A calculated reduction factor which may be applied to laboratory test values to obtain safe working stresses for wooden beams and other mechanical members; ratio of breaking load to safe load.

Saw guide. A device for steadying a circular or bandsaw.

Setwork. A mechanism on a sawmill carriage which enables an operator to move the log into position for another cut.

Sorting gaps. The areas on a log pond enclosed by boom sticks into which logs are sorted.

Spreader wheel. A metal wheel that separates the board from the log in back of circular saws to prevent binding.

Splitter. A knife-type, nonrotating spreader.

Sticker. A strip of wood or other material used to separate layers of lumber.

Stiff boom. The anchored, stationary boom sticks which are tied together and on which boom men work.

Swifter. A means of tying boom sticks together to prevent them from spreading while being towed.

Telltale. A device used to serve as a warning for overhead objects.

Top saw. The upper of two circular saws on a head rig, both being on the same husk.

Tramway. A way for trams, usually consisting of parallel tracks laid on wooden beams.

Trestle. A braced framework of timbers, piles or steelwork for carrying a road or railroad over a depression.

Definitions applicable to 1910.266, Pulpwood logging:

Arch. An extension to rear section of a vehicle used in skidding used to raise the forward part of a load clear of the ground.

Back cut (felling cut). The final cut in a felling operation made on the opposite side from the undercut.

Backfill. Excavated material used to build up a road higher than the original level.

Ballistic nylon. A fabric of high tensile properties designed to provide protection from lacerations.

Borrow. Road construction material which is taken to another location for use. The source area is called "borrow pit."

Buck. The process of severing a tree into sections (logs or bolts).

Choker. A length of wire rope or chain with a loop or noose at one end used to secure trees or sections of trees for skidding.

Debark. The action of removing bark from trees or sections of trees. Debark generally denotes mechanical means as opposed to manual peeling. Synonyms are "bark" and "barking."

Fairlead. An arrangement of horizontal, and sometimes vertical, rollers usually mounted at the end of an arch to allow free play of wire rope during winching.

Fell. The process of severing a tree from the stump so that it drops to the ground.

Grade (see slope). The slope of a surface such as a roadway. Also, the elevation of a real or planned surface or structure.

Guarded. Protected by a cover shield, rail, or other device, or by location, so as to reduce the probability of injury.

Guyline. A line used to stay or support spar trees, booms, etc.

Landing. Any area where wood is concentrated. It is also called "yard," "deck," "brow."

Lodged tree. A tree that has not fallen to the ground after being partly or wholly separated from its stump or otherwise displaced from its natural position.

Pickaroon. A device with a head similar to an axe but with a point rather than a blade mounted on the end of a handle which is used to assist in the lifting and placement of bolts of wood.

Prehaul. The hauling of forest products by off-the-road vehicles, nonhighway transport, or other movement prior to highway or rail movement, where the pulpwood travels clear of the ground. The term "forward" has the same meaning.

Riprap. Rock metal stripping, or wooden timbers used to contain and stabilize earth embankments and fills.

Root wad. The ball of roots which extends above ground level when a tree is pushed over by wind or other means.

Skid. The movement of bolts, logs, or trees by pulling or towing across terrain.

Slope (see grade). A term of measurement in percent and means the increase in height over the distance measured. An increase of 1 foot over distance of 5 feet is expressed as a 20 percent slope.

Snag. Any dead standing tree or portion thereof remaining standing.

Spring pole. A section of tree, sapling, limb, etc. which is, by virture of its arrangement with relation to other materials, under tension.

Undercut. A notch cut in a tree to guide the tree in felling.

Widow maker. An overhanging limb or section of tree which could become dislodged and drop to the ground (see also "lodged tree").

Wood hook. A device to be held in one hand which is fitted with a pointed section. The device is used to assist in the manual piling and handling of bolts of wood (see Pickaroon).

Definitions applicable to 1910.268, Telecommunications:

Aerial lifts. Aerial lifts include the following types of vehicle-mounted aerial devices used to elevate personnel to jobsites above ground.

(i) Extensible boom platforms,
(ii) Aerial ladders,
(iii) Articulating boom platforms,
(iv) Vertical towers,
(v) A combination of any of the above defined in ANSI A92.2-1969.

Aerial splicing platform. A platform, approximately 3 ft. x 4 ft., used to perform aerial cable work. It is furnished with fiber or synthetic ropes for supporting the platform from aerial strand, detachable guy ropes for anchoring it, and a device for raising and lowering it with a handline.

Aerial tent. A small tent usually constructed of vinyl coated canvas which is usually supported by light metal ot plastic tubing. It is designed to protect employees in inclement weather while working on ladders, aerial splicing platforms, or aerial devices.

Alive or live (energized). Electrically connected to a source of potential difference, or electrically charged so as to have a potential significantly different from that of the earth in the vicinity. The term "live" is sometimes used in the place of the term "current-carrying," where the intent is clear, to avoid repetition of the longer term.

Barricade. A physical construction such as types, cones, or "A" frame type wood and/or metal structure intended to warn and limit access to a work area.

Barrier. A physical obstruction which is intended to prevent contact with energized lines or equipment, or to prevent unauthorized access to work area.

Bond. An electrical connection from one conductive element to another for the purpose of minimizing potential differences or providing suitable conductivity for fault current or for mitigation of leakage current and electrolytic action.

Cable. A conductor with insulation, or a standard conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors insulated from one another (mutilple-conductor cable).

Cable sheath. A protective covering applied to cables.

Note: A cable sheath may consist of multiple layers of which one or more is conductive.

Circut. A conductor or system of conductors through which an electric current is intended to flow.

Communication lines. The conductors and their supporting or containing structures for telephone, telegraph, railroad signal, data, clock, fire, police-alarm, community television antenna and other systems which are used for public or private signal or communication service, and which operate at potentials not exceeding 400 volts to ground or 750 volts between any two points of the circuit, and the transmitted power of which does not exceed 150 watts. When communications lines operate at less than 150 volts to ground, no limit is placed on the capacity of the system. Specifically designed communications cables may include communication circuits not complying with the preceding limitations, where such circuits are also used incidentally to supply power to communication equipment.

Conductor. A material, usually in the form of a wire, cable, or bus bar, suitable for carrying an electric current.

Effectively grounded. Intentionally connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the build-up of voltages which may result in undue hazard to connected equipment or persons.

Ground (reference). That conductive body, usually earth, to which an electric potential is referenced.

Ground (as a noun). A conductive connection, whether intentional or accidental, by which an electric circuit or equipment is connected to reference ground.

Ground (as a verb). The connecting or establishment of a connection, whether by intention or accident, of an electric circuit or equipment to reference ground.

Ground tent. A small tent usually constructed of vinyl coated canvas supported by a metal or plastic frame. Its purpose is to protect employees from inclement weather while working at buried cable pedestal sites or similar locations.

Grounded conductor. A system or circuit conductor which is intentionally grounded.

Grounded systems. A system of conductors in which at least one conductor or point (usually the middle wire, or the neutral point of transformer or generator windings) is intentionally grounded, either solidly or through a current-limiting device (not a current-interrupting device).

Grounding electrode conductor. (Grounding conductor). A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode.

Insulated. Separated from other conducting surfaces by a dielectric substance (including air space) offering a high resistance to the passage of current.

Note. — When any object is said to be insulated, it is understood to be insulated in suitable manner for the conditions to which it is subjected. Otherwise, it is, within the purpose of these rules, uninsulated. Insulating coverings of conductors is one means of making the conductor insulated.

Insulation (as applied to cable). That which is relied upon to insulate the conductor fron other conductors or conducting parts or from ground.

Joint use. The sharing of a common facility, such as a manhole, trench or pole, by two or more different kinds of utilities (e.g., power and telecommunications).

Ladder platform. A device designed to facilitate working aloft from an extension ladder.

Ladder seat. A removable seat used to facilitate work at an elevated position on rolling ladders in telecommunication centers.

Manhole. A subsurface enclosure which personnel may enter and which is used for the purpose of installing, operating, and maintaining submersible equipment and/or cable.

Manhole platform. A platform consisting of separate planks which are laid across steel platform supports. The ends of the supports are engaged in the manhole cable racks.

Microwave transmission. The act of communicating or signaling utilizing a frequency between 1 GHz (gigahertz) and 300 GHz inclusively.

Nominal voltage. The value assigned to a system or circuit of a given voltage class for the purpose of convenient designation. The actual voltage may vary above or below this value.

Pole balcony or seat. A support for workmen at pole-mounted equipment or terminal boxes.

Pole Platform. A platform intended for use by a workman in splicing and maintenance operations in an elevated position adjacent to a pole.

Qualified employee. Any worker who by reason of his training and experience has demonstrated his ability to safely perform his duties.

Qualified line-clearance tree trimmer. A tree worker who through related training and on-the-job experience is familiar with the special techniques and hazards involved in line clearance.

Qualified line-clearance tree-trimmer trainee. Any worker regularly assigned to a line-clearance tree-trimming crew and under-going on-the-job training who, in the course of such training, has demonstrated his ability to perform his duties safely at his level of training.

System operator/owner. The person or organization that operates or controls the electrical conductors involved.

Telecommunications center. An installation of communication equipment under the exclusive control of an organization providing telecommunications service, that is located outdoors or in a vault, chamber, or a building space used primarily for such installations.

Note. — Telecommunication centers are facilities established, equipped and arranged in accordance with engineered plans for the purpose of providing telecommunications service. They may be located on premises owned or leased by the organization providing telecommunication service, or on the premises owned or leased by others. This definition includes switch rooms (whether electromechanical, electronic, or computer controlled), terminal rooms, power rooms, repeater rooms, transmitter and receiver rooms, switchboard operating rooms, cable vaults, and miscellaneous communications equipment rooms. Simulation rooms of telecommunication centers for training or developmental purposes are also included.

Telecommunications derricks. Rotating or nonrotating derrick structures permanently mounted on vehicles for the purpose of lifting, lowering, or positioning hardware and materials used in telecommunications work.

Telecommunication line truck. A truck used to transport men, tools, and material, and to serve as a traveling workshop for telecommunication installation and maintenance work.

Telecommunication service. The furnishing of a capability to signal or communicate at a distance by means such as telephone, telegraph, police and fire-alarm, community antenna television, or similar system, using wire, conventional cable, coaxial cable, wave guides, microwave transmission, or other similar means.

Unvented vault. An enclosed vault in which the only openings are access openings.

Vault. An enclosure above or below ground which personnel may enter and which is used for the purpose of installing, operating, and/or maintaining equipment and/or cable which need not be submersible design.

Vented vault. An enclosure with provision for air changes using exhaust flue stack(s) and low level air intake(s), operating on differentials of pressure and temperature providing for air flow.

Voltage of an effectively grounded circuit. The voltage between any conductor and ground unless otherwise indicated.

Voltage of a circuit not effectively grounded. The voltage between any two conductors.

Definitions applicable to 1910.272, Grain handling facilities:

Choked leg. A condition of material buildup in the bucket elevator that results in the stoppage of material flow and bucket movement. (A bucket elevator is not considered choked if it has the up-leg partially or fully loaded and has the boot and discharge cleared, allowing bucket movement.)

Fugitive grain dust. Combustible dust particles, emitted from the stock handling system, of such size that they will pass through a U.S. Standard 40 mesh sieve (425 microns or less).

Hot work. Work that involves electric or gas welding, cutting, brazing, or similar flame-producing operations.

Inside bucket elevator. A bucket elevator that has the boot and more than 20% of the total leg height (above grade or ground level) inside the grain elevator structure. Bucket elevators with leg casings that are inside (and pass through the roofs) of rail or truck dump sheds with the remainder of the leg outside of the grain elevator structure, are not considered inside bucket elevators.

Jogging. Repeated starting and stopping of drive motors in an attempt to clear choked legs.

Lagging. A covering on drive pulleys used to increase the coefficient of friction between the pulley and the belt.

Permit. The written certification by the employer authorizing employees to perform identified work operations subject to specified precautions.

1910.261 – PULP, PAPER AND PAPERBOARD MILLS.

YES NO

(a) General.

Application. (a)(1)

The following items apply to establishments where pulp, paper, and paperboard are manufactured and converted. The following items **do not** apply to logging and the transportation of logs to pulp, paper and paperboard mills. (a)(1)

(b) Safe Practices.

Guards. (b)(1)

Are all driving mechanisms, power-transmission apparatus, and prime movers constructed, guarded, and used in conformity with American National Standard B15.1-1963? (b)(1)

Personal Protective Clothing and Equipment. (b)(2)

Are foot protection, shin-guards, hard hats, noise attenuation devices, or other personal protective clothing and equipment worn when the extent of the hazard is such as to warrant their use? (b)(2)

Is all such equipment maintained in accordance with applicable American National Standards? (b)(2)

Are respirators, goggles, and protective masks, rubber gloves, rubber boots, and other such equipment cleaned and disinfected before being used by another employee? (b)(2)

Floors and Platforms. (b)(3)

Are floors, platforms, and work surfaces maintained in accordance with ANSI A12.1-1967? (b)(3)

Lockouts. (b)(4)

Are devices such as padlocks provided for locking out the source of power at the main disconnect switch? (b)(4)

Before any maintenance, inspection, cleaning, adjusting, or servicing of equipment that requires entrance into or close contact with the machinery or equipment, is the main power disconnect switch or valve, or both, controlling its source of power or flow of material locked out or blocked off with padlock, blank flange, or similar device? (b)(4)

Vessel Entering. (b)(5)

Are lifelines and safety harnesses provided and worn by anyone entering closed vessels, tanks, chip bins, and similar equipment? (b)(5)

Is a person stationed outside in a position to handle the line and to summon assistance in case of emergency? (b)(5)

Is the air in the vessels tested for oxygen deficiency and the presence of both toxic and explosive gases and vapors, before entry into closed vessels, tanks, etc.? (b)(5)

Are self-contained air- or oxygen-supply masks readily available in case of emergency? (b)(5)

Is work prohibited from being done on equipment under conditions where an injury would result if a valve were unexpectedly opened or closed? (b)(5)

Industrial Power Trucks. (b)(6)

Do all industrial power truck operations conform to ANSI B56.1-1969? (b)(6)

1910.261 – PULP, PAPER AND PAPERBOARD MILLS
(b) Safe Practices.

YES NO

Are all forklift trucks provided with overhead guards? (b)(6)

Are all such guards designed in compliance with ANSI B56.1-1969? (b)(6)

Do design requirements provide protection for the liquid petroleum tank? (b)(6)

Emergency Lighting. (b)(7)

Is emergency lighting provided wherever it is necessary for employees to remain at their machines or stations to shut down equipment in case of power failure? (b)(7)

Is emergency lighting provided at stairways and passageways or aisleways in case of power-failure? (b)(7)

Is emergency lighting provided in all plant first aid and medical facilities? (b)(7)

(c) Handling and Storage of Pulpwood and Pulp Chips.

Handling Pulpwood With Forklift Trucks. (c)(1)

Where large forklift trucks or lift trucks with clam-jaws are used in the yard, and the hydraulic arm may block the side doors, is the operator's enclosed cab provided with an escape hatch? (c)(1)

Handling Pulpwood With Cranes or Stackers. (c)(2)

Where locomotive cranes are used for loading or unloading pulpwood, is the pulpwood piled so as to allow a clearance of not less than 24 inches between the pile and the end of the cab of any locomotive crane, when the cab is turned in any working position? (c)(2)(i)

Is pulpwood required to be piled at least 8½ feet from the centerline of any standard-gage truck? (c)(2)(ii)

Are logs piled in an orderly and stable manner, with no projection into walkways or roadways? (c)(2)(iii)

Are railroad cars prohibited from being spotted on tracks adjacent to the locomotive cranes unless the 24-inch clearance is maintained as required in (i) above? (c)(2)(iv)

Does the handling and storage of other materials conform to (i) and (ii) above? (c)(2)(v)

Does all materials handling equipment, such as cranes and hoists, conform to ANSI Standards B30.2-1943 (Reaffirmed in 1952) and B30.2.0-1967? (c)(2)(vi)

Is personal protective equipment for feet, head, and eye protection used as required? (c)(2)(vii)

Are persons prohibited from walking or standing beneath a suspended load, bucket or hook? (c)(2)(viii)

Handling Pulpwood From Ships. (c)(3)

Do ladders and gangplanks with railings to boat docks meet the requirements of ANSI A12.1-1967, A14.1-1968, A14.2-1956, and A14.3-1956, and are they securely fastened in place? (c)(3)(i)

Are precautions taken to insure that hatchtenders will give the signal to the winch operators to move the load only after the men working in the hold are in the clear? (c)(3)(ii)

Is the air in the ship's holds, tanks, or closed vessels tested for oxygen deficiency and for both toxic and explosive gases and vapors? (c)(3)(iii)

1910.261 – PULP, PAPER AND PAPERBOARD MILLS
(c) Handling and Storage of Pulpwood and Pulp Chips.

	YES	NO
Handling Pulpwood From Flatcars and All Other Railway Cars. (c)(4)		
Are railroad flatcars for the conveyance of pulpwood loaded parallel to the length of the car equipped with safety-stake pockets? (c)(4)(i)		
Where pulpwood is loaded crosswise on a flatcar are sufficient stakes of sizes not smaller than 4 by 4 inches used to prevent the load from shifting? (c)(4)(ii)		
Are procedures established that when it is necessary to cut stakes, those on the unloading side will be partially cut through first, and then the binder wires cut on the opposite side? (c)(4)(iii)		
Are wire cutters equipped with long extension handles? (c)(4)(iii)		
Are persons prohibited from being along the dumping side of the car after the stakes have been cut? (c)(4)(iii)		
When steel straps without stakes are used, are the steel straps cut from a safe area? (c)(4)(iv)		
Are flatcars and all other cars chocked during unloading? (c)(4)(v)		
Where equipment is not provided with hand brakes, are rail clamping chocks used? (c)(4)(v)		
Are derails used to prevent movement of other rail equipment into cars where persons are working? (c)(4)(vi)		
Handling Pulpwood From Trucks. (c)(5)		
Is the cutting of stakes and other wires done in accordance with the items under (4)(iii) above? (c)(5)(i)		
Where binder chains and steel stakes are used, are the binder chains released and the stakes tripped from the opposite side of the load spillage? (c)(5)(ii)		
Where binder chains and crane slings are used, are the crane slings attached and taut before the binder chains are released? (c)(5)(iii)		
Is the hooker required to see that the helper is clear before signaling for the movement of the load? (c)(5)(iii)		
Handling Pulp Chips From Railway Cars. (c)(6)		
Are precautions taken to insure that all cars are securely fastened in place and all employees in the clear before dumping is started? (c)(6)(i)		
Is personal protective equipment provided, and are employees required to wear the equipment when working in the woodyard? (c)(6)(ii)		
Is ear protection provided and used when the noise exceeds those levels in 1910.95? (c)(6)(ii)		
Handling Pulp Chips From Trucks and Trailers. (c)(7)		
Are all trucks and trailers securely fastened in place and all employees in the clear before dumping is started? (c)(7)(i)		
Is personal protective equipment in accordance with the items under (6)(ii) above? (c)(7)(ii)		
Cranes. (c)(8)		
Are crane boom and load capacities as specified by the manufacturer posted in the cab of the crane in accordance with ANSI B30.2.0-1967? (c)(8)(i)		

1910.261 – PULP, PAPER AND PAPERBOARD MILLS
(c) Handling and Storage of Pulpwood and Pulp Chips.

	YES	NO
Is the crane provided with a device to prevent the boom from snapping back over the cable, and in the event of lifting cable breakage? (c)(8)(ii)		
Are cranes prohibited from being operated where any part thereof may come within 10 feet of overhead powerlines, unless the powerlines have been deenergized? (c)(8)(iii)		
Is the boom painted bright yellow from and including the head sheave to a point 6 feet down the boom towards the cab? (c)(8)(iii)		
Are standard signals for the operation of cranes established for all movements of the crane, in accordance with ANSI B30.2.0-1967? (c)(8)(iv)		
Is only one member of the crew authorized to give signals to the crane operator? (c)(8)(v)		
Are all cranes equipped with a suitable warning device such as a horn or whistle? (c)(8)(vi)		
Is a sheave guard provided beneath the head sheave of the boom? (c)(8)(vii)		
Traffic Warning Signs or Signals. (c)(9)		
Does a flagman direct the movement of cranes or locomotives being moved across railroad tracks or roads where the vision of the operator is restricted? (c)(9)(i)		
When a flagman is used, is he always in sight of the operator when the crane or locomotive is in motion? (c)(9)(i)		
Is the blue flag policy used to mark stationary cars day and night? (c)(9)(i)		
Does this policy include marking the track in advance of the spotted cars with a flag for daytime and a light for darkness? (c)(9)(i)		
After cars are spotted for loading or unloading, are warning flags or signs placed in the center of the track at least 50 feet away from the cars, and is there a derail set to protect workmen in the car? (c)(9)(ii)		
Illumination. (c)(10)		
Is artificial illumination provided when loading or unloading is performed after dark, in accordance with ANSI A11.1-1965? (c)(10)		
Bridge or Dock Plates. (c)(11)		
Does the construction and use of bridge or dock plates conform to the requirements of ANSI B56.1-1969? (c)(11)		
Barking Devices. (c)(12)		
When the barking drums are employed in the yard, are the items under (e)(12) of this checklist complied with? (c)(12)		
Hand Tools. (c)(13)		
Are the handles of wood hooks locked to the shank to prevent them from rotating? (c)(13)		
Removal of Pulpwood. (c)(14)		
Are the ends of a woodpile properly sloped and cross-tiered into the pile? (c)(14)(i)		
Is the use of upright poles at the ends of woodpiles prohibited? (c)(14)(i)		
Is mechanical equipment used to knock down wood from the woodpile? (c)(14)(i)		

1910.261 – PULP, PAPER AND PAPERBOARD MILLS

(c) Handling and Storage of Pulpwood and Pulp Chips.

	YES	NO
If dynamite is used to loosen the pile, are only authorized personnel permitted to handle and discharge the explosive? (c)(14)(ii)		
If a fuse is used, is it an approved safety fuse with a burning rate of not less than 120 seconds per yard and a minimum length of 3 feet, in accordance with Safety in the Handling and Use of Explosives, IME Pamphlet No. 17, July 1960? (c)(14)(ii)		
Belt Conveyors. (c)(15)		
Are the sides of the conveyor constructed so that the wood will not fall off? (c)(15)(i)		
Where conveyors cross passageways or roadways, is a horizontal platform provided under the conveyor extending out from the sides of the conveyor a distance equal to 1½ times the length of the wood handled? (c)(15)(ii)		
Does the platform extend the width of the road plus 2 feet on each side and is it kept free of wood and rubbish? (c)(15)(ii)		
Are the edges of the platform provided with a toeboard or other protection to prevent wood from falling, in accordance with ANSI A12.1-1967? (c)(15)(ii)		
Do all conveyors for pulpwood have the inrunning nips between chain and sprockets guarded, and are turning drums also guarded? (c)(15)(iii)		
Is every belt conveyor provided with an emergency stop cable extending the length of the conveyor, or conveniently located stop buttons within 10 feet of each work station, in accordance with ANSI B20.1-1957? (c)(15)(iv)		
Signs. (c)(16)		
Where conveyors cross walkways or roadways in the yard, are signs reading "Danger-Overhead Conveyor" erected, in accordance with ANSI Z35.1-1968? (c)(16)		
(d) Handling and Storage of Raw Materials Other Than Pulpwood or Pulp Chips.		
Personal Protective Equipment. (d)(1)		
Whenever possible, are all dust, fumes, and gases incident to handling materials controlled at the source, in accordance with ANSI Z9.2-1960? (d)(1)(i)		
Where control at the source is not possible, are respirators with goggles or protective masks provided, and are employees required to wear them when handling alum, clay, soda ash, lime, bleach powder, sulfur, chlorine, and similar materials, and when opening rag bales? (d)(1)(i)		
When handling liquid acid or alkali, are workmen provided with approved eye and face protection and protective clothing, in accordance with ANSI Z87.1-1968? (d)(1)(ii)		
Clearance. (d)(2)		
When materials are being piled inside a building and upon platforms, is an aisle clearance at least 3 feet greater than the widest truck in use provided? (d)(2)(i)		
Is baled paper and rags stored inside a building prohibited from being piled closer than 18 inches to walls, partitions, or sprinkler heads? (d)(2)(ii)		

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(d) Handling and Storage of Raw Materials Other Than Pulpwood or Pulp Chips.

	YES	NO
Piling and Unpiling Pulp. (d)(3)		
Are piles of wet lap pulp stepped back one-half the width of the sheet for each 8 feet of pile height, unless palletized? (d)(3)(i)		
Are sheets of pulp interlapped to make the pile secure? (d)(3)(i)		
Is pulp prohibited from being piled over pipelines? (d)(3)(i)		
Is pulp prohibited from being piled so that it would overload the floor, or within 18 inches from sprinkler heads? (d)(3)(i)		
When unpiling piles of pulp, are precautions taken to insure that they will not be undermined? (d)(3)(ii)		
Are floor capacities marked clearly on all floors? (d)(3)(iii)		
Chocking Rolls. (d)(4)		
Where rolls are pyramided two or more high, are chocks installed between each roll on the floor and at every row? (d)(4)(ii)		
Where pulp and paper rolls are stored on smooth floors in processing areas, are rubber chocks with wood core used? (d)(4)(ii)		
When rolls are decked two or more high, are the bottom rolls chocked on each side to prevent shifting in either direction? (d)(4)(iii)		
(e) Preparing Pulpwood.		
Gang and Slasher Saws. (e)(1)		
Is a guard provided in front of all gang and slasher saws to protect workers from wood thrown by saws? (e)(1)		
Is a guard placed over tail sprockets? (e)(1)		
Slasher Tables. (e)(2)		
Are saws required to be stopped and are power switches locked out and tagged whenever it is necessary for any person to be on the slasher table? (e)(2)		
Slasher Drive Belts, Pulleys, and Shafts. (e)(3)		
Are all belts, pulleys, and shafts guarded in accordance with ANSI B15.1-1955? (e)(3)		
Runway to the Jack Ladder. (e)(4)		
Is the runway from the pond or unloading dock to the table protected with standard handrails and toeboards? (e)(4)		
Do inclined portions have cleats or equivalent nonslip surfacing, in accordance with ANSI A12.1-1967? (e)(4)		
Is protective equipment provided for persons working over water? (e)(4)		

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(e) Preparing Pulpwood.

YES NO

Guards Below Table. (e)(5)

Where not protected by the frame of the machine, is the underside of the slasher saws enclosed with guards? (e)(5)

Conveyors. (e)(6)

Are the items under (c)(15)(iv) above complied with where conveyors are used? (e)(6)

Circular Saws. (e)(7)

Are saws provided with standard guards, in accordance with ANSI 01.1-1954? (e)(7)

Barker Feed. (e)(8)

Is each barker equipped with a feed and turnover device which will make it unnecessary for the operator to hold a bolt or log by hand during the barking operation? (e)(8)

Is eye, ear, and head protection provided for the operator, in accordance with the items under (b)(2) above? (e)(8)

Guards. (e)(9)

Are guards installed around barkers to confine flying particles, in accordance with ANSI B15.1-1953? (e)(9)

Stops. (e)(10)

Are control devices locked out and tagged when knives are being changed? (e)(10)

Speed Governor. (e)(11)

When water wheels are directly connected to marker disks or grinders, are they provided with speed governors, if operated with gate wide open? (e)(11)

Continuous Barking Drums. (e)(12)

When platforms or floors allow access to the sides of the drums, is a standard railing constructed around the drums? (e)(12)(i)

When two or more drums are arranged side by side, are proper walkways with standard handrails provided between each set, in accordance with the items under (b)(3) above? (e)(12)(i)

Do sprockets and chains, gears, and trunnions have standard guards, in accordance with the requirements of (b)(1) above? (e)(12)(ii)

When it becomes necessary for a workman to go within a drum, is the driving mechanism locked and tagged at the main disconnect switch, in accordance with the items under (b)(4) above? (e)(12)(iii)

Intermittent Barking Drums. (e)(13)

In addition to motor switch, clutch, belt shifter, or other power disconnecting device, are intermittent barking drums equipped with a device which may be locked to prevent the drum from moving while it is being emptied or filled? (e)(13)

Hydraulic Barkers. (e)(14)

Are hydraulic barkers enclosed with strong baffles at the inlet and the outlet? (e)(14)

Is the operator protected by at least five-ply laminated glass? (e)(14)

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(e) Preparing Pulpwood.

YES NO

Splitter Block. (e)(15)

Is the block upon or against which the wood is rested equipped with a corrugated surface or other means provided so that the wood will not slip? (e)(15)

Is the wood to be split, and also the splitting block, free of ice, snow, or chips? (e)(15)

Is the operator provided with eye and foot protection? (e)(15)

Is a clear and unobstructed view maintained between equipment and workers around the block and the workers' help area? (e)(15)

Power Control. (e)(16)

Is the power for the operation of the splitter controlled by a clutch or equivalent device? (e)(16)

Knot Cleaners. (e)(17)

Do the operators of knot cleaners of the woodpecker type wear eye protection equipment? (e)(17)

Chipper Spout. (e)(18)

Is the feed system to the chipper spout arranged in such a manner that the operator will not stand in a direct line with the chipper spout? (e)(18)

Are all chipper spouts enclosed to a height of at least 42 inches from the floor or operator's platform? (e)(18)

When other protection is not sufficient, is the operator required to wear a safety belt line? (e)(18)

Is the safety belt line fastened in such a manner as to make it impossible for the operator to fall into the throat of the chipper? (e)(18)

Is ear protection provided and required to be worn by the operator and others in the immediate area if there is any possibility that the noise level may be harmful? (e)(18)

Carriers for Knives. (e)(19)

Are carriers provided and used for transportation of knives? (e)(19)

(f) Rag and Old Paper Preparation.

Ripping and Trimming Tools. (f)(1)

Are hand knives and scissors provided with blunt points, and are they fastened to the table with chain or thong? (f)(1)(i)

Are hand knives and scissors prohibited from being carried on the person? (f)(1)(i)

Are they placed in racks or sheaths when not in use? (f)(1)(i)

Are hand knives and sharpening steels provided with guards at the junction of the handle and the blade? (f)(1)(ii)

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(f) Rag and Old Paper Preparation.

	YES	NO
Shredders, Cutters, and Dusters. (f)(2)		
Are rotating heads or cylinders completely enclosed, except for an opening at the feed side sufficient to permit only the entry of stock? (f)(2)(i)		
Is the enclosure extended over the top of the feed rolls? (f)(2)(i)		
Is it constructed either of solid material or with mesh or openings not exceeding one-half inch, and is it substantial enough to contain flying particles and prevent accidental contact with moving parts? (f)(2)(i)		
Is the enclosure bolted or locked into place? (f)(2)(i)		
Is a smooth-pivoted idler roll resting on the stock or feed table provided in front of feed rolls except when the arrangements prevent the operator from standing closer than 36 inches to any part of the feed rolls? (f)(2)(ii)		
Are all manually fed cutters, shredders, or dusters provided with an idler roll as per the item immediately above, or is the operator required to use special hand-feeding tools? (f)(2)(iii)		
Are hoods of cutters, shredders, and dusters equipped with exhaust ventilation, in accordance with ANSI Z9.2-1960? (f)(2)(iv)		
Blowers. (f)(3)		
Are blowers used for transporting rags provided with feed hoppers having outer edges located not less than 48 inches from the fan? (f)(3)(i)		
Is the arrangement of the blower discharge outlets and work areas such as to prevent material from falling on workers? (f)(3)(ii)		
Conveyors. (f)(4)		
Are conveyors and conveyor drive belts and pulleys fully enclosed or, if open and within 7 feet of the floor, constructed and guarded in accordance with items under (c)(15) which follow in normal sequence, and ANSI B15.1-1953, and B20.1-1957? (f)(4)		
Dust. (f)(5)		
Are measures for the control of dust provided in accordance with ANSI Z33.1-1961, Z87.1-1968, and Z88.2-1969? (f)(5)		
Rag Cookers. (f)(6)		
When persons are required to enter rag cookers, are all steam and water valves, or other control devices locked and tagged in the closed or "off" position? (f)(6)(i)		
When persons are required to enter a cooker, is at least one person stationed outside in a position to observe and assist in case of emergency, in accordance with items under (b)(5) above? (f)(6)(ii)		
Are rag cookers provided with safety valves in accordance with the ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels - 1968, with Addenda? (f)(6)(iv)		

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	YES	NO
(g) Chemical Processes of Making Pulp.		
Sulfur Burners. (g)(1)		
Are sulfur-burner houses safely and adequately ventilated? (g)(1)(i)		
Is every precaution taken to guard against dust explosion hazards and fires, in accordance with ANSI Z9.2-1960 and Z12.12-1968? (g)(1)(i)		
Are nonsparking tools and equipment used in handling dry sulfur? (g)(1)(ii)		
Is electrical equipment of the explosion-proof type, in accordance with the requirements of the National Electrical Code of 1970? (g)(1)(iv)		
Is sulfur-melting equipment prohibited from being located in the burner room? (g)(1)(v)		
Protection for Employees (acid plants). (g)(2)		
Are gas masks, fitted with canisters containing absorbents for the particular acids, gases, or mists involved, provided for employees of the acid department? (g)(2)(i)		
Are supplied air respirators strategically located for emergency and rescue use? (g)(2)(ii)		
During inspection, repairs, or maintenance of acid towers, is the workman provided with eye protection, a supplied air respirator, a safety belt, and an attached lifeline? (g)(2)(iii)		
Is the line extended to an attendant stationed outside the tower opening? (g)(2)(iii)		
Acid Tower Structure. (g)(3)		
Are outside elevators inspected daily during winter months when ice materially affects safety? (g)(3)		
Are elevators, runways, stairs, etc., for the acid tower inspected monthly for defects that may occur because of exposure to acid or corrosive gases? (g)(3)		
Tanks (acid). (g)(4)		
Are tanks free of acid and washed out with water, and is fresh air blown into them before allowing men to enter? (g)(4)(i)		
Are men who enter the tanks provided with supplied air respirators, lifebelts, and attached lifelines? (g)(4)(i)		
Is a man stationed outside to summon assistance if necessary? (g)(4)(ii)		
Are all intake valves to a tank blanked off or disconnected? (g)(4)(ii)		
Clothing. (g)(5)		
Where lime slaking takes place, are employees provided with rubber boots, rubber gloves, protective aprons, and eye protection? (g)(5)		
Is a deluge shower and eye fountain provided to flush the skin and eyes to counteract lime or acid burns? (g)(5)		

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(g) Chemical Processes of Making Pulp.

	YES	NO
Lead Burning. (g)(6)		
When lead burning is being done within tanks, is fresh air forced into the tanks so that fresh air will reach the face of the worker first, and the direction of the current will never be from the source of the fumes toward the face of the workers? (g)(6)		
Are supplied air respirators provided? (g)(6)		
Hoops for Acid Storage Tanks. (g)(7)		
Are hoops for tanks made of rods rather than flat strips, and are they safely maintained by scheduled inspections? (g)(7)		
Chip and Sawdust Bins. (g)(8)		
Are steam or compressed-air lances, or other facilities used for breaking down the arches caused by jamming in chip lofts? (g)(8)		
Are workers prohibited from entering a bin unless provided with a safety belt, with line attached, and an attendant stationed at the bin to summon assistance? (g)(8)		
Exits (digester building). (g)(9)		
Is at least one unobstructed exit at each end of the room provided on each floor of a digester building? (g)(9)		
Gas Masks (digester building). (g)(10)		
Are gas masks available? (g)(10)		
Do such masks furnish adequate protection against sulfurous acid and chlorine gases, and are they inspected and tested at frequent intervals, not to exceed one month, in accordance with ANSI Z87.1-1968 and Z88.2-1969? (g)(10)		
Elevators. (g)(11)		
Are elevators constructed in accordance with ANSI A17.1-1965? (g)(11)(i)		
Are elevators equipped with gas masks for the maximum number of passengers? (g)(11)(ii)		
Are elevators equipped with an alarm system to advise of failure? (g)(11)(iii)		
Blowoff Valves and Piping. (g)(12)		
Are the blowoff valves of a digester arranged so as to be operated from another room, remote from safety valves? (g)(12)(i)		
Are through bolts instead of cap bolts used on all digester pipings? (g)(12)(ii)		
Is heavy duty pipe, valves, and fittings used between the digester and blow pit? (g)(12)(iii)		
Are these valves, fittings, and pipes inspected at least semi-annually to determine the degree of deterioration? (g)(12)(iii)		
Are digester blow valves pinned or locked in closed position throughout the entire cooking period? (g)(12)(iv)		
Blow Pits and Blow Tanks. (g)(13)		
Are blow-pit openings located on the side of the pit instead of on the top? (g)(13)(i)		
When located on top, are the openings as small as possible and are they provided with railings, in accordance with ANSI A12.1-1967? (g)(13)(i)		

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(g) Chemical Processes of Making Pulp.

	YES	NO
Is a specially constructed ladder used for access to blow pits, and is the construction such that the door of the blow pit cannot be closed when the ladder is in place? (g)(13)(ii)		
Are other means provided to prevent the closing of the pit door when anyone is in the pit? (g)(13)(ii)		
Is a signaling device installed in the digester and blow-pit rooms and chip bins, to be operated as a warning before and while digesters are being blown? (g)(13)(iii)		
Are blow-pit hoops maintained in a safe condition? (g)(13)(iv)		
Blowing Digester. (g)(14)		
Are blowoff valves required to be opened slowly? (g)(14)(i)		
After the digester has started to be blown, is the blowoff valve left open, and is the hand plate required not to be removed until the digester cook signals the blow-pit man that the blow is completed? (g)(14)(ii)		
Whenever it becomes necessary to remove the hand plate to clear stock, are operators required to wear eye protection equipment and protective clothing to guard against burns from hot stock? (g)(14)(ii)		
Are means provided whereby the digester cook will signal the man in the chip bin before starting to load the digester? (g)(14)(iii)		
Inspecting and Repairing Digester. (g)(15)		
Are valves controlling lines leading into a digester locked out and tagged? (g)(15)(i)		
Are the keys to the locks in the possession of a person or persons doing the inspecting or making repairs? (g)(15)(i)		
Is fresh air blown into the digester constantly while workmen are inside? (g)(15)(ii)		
Are supplied fresh air respirators available in the event the fresh air supply fails or is inadequate? (g)(15)(ii)		
Are inspectors required to have a lifeline securely fastened to his body by means of a safety belt before entering a digester? (g)(15)(iii)		
Is at least one other experienced employee stationed outside the digester to handle the line and to summon assistance? (g)(15)(iii)		
Are all ladders and lifelines inspected before each use? (g)(15)(iii)		
● Are precautions taken to insure that the concentration of lead dust in the air will not exceed the limits specified in 1910.1000 of this checklist? (g)(15)(iv)		
Before entering digesters for inspection or repair work, are all employees provided with protective headgear? (g)(15)(v)		
Is eye protection and are dust masks provided to workmen while the old brick lining is being removed, in accordance with ANSI Z87.1-1968, Z88.2-1969, and Z89.1-1969? (g)(15)(v)		

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(g) Chemical Processes of Making Pulp.

YES NO

Are sanitary facilities provided as specified in ANSI Z4.1-1968? (g)(15)(vi)

Pressure Tanks-Accumulators (acid). (g)(16)

Are the items listed above in (15) followed where inspections and repair of pressure tanks, -accumulators are involved? (g)(16)(i)

Are pressure tanks-accumulators inspected twice annually? (g)(16)(ii)

Pressure Vessels (safety devices). (g)(17)

Is a safety valve installed in a separate line from each pressure vessel? (g)(17)(i)

Is the installation of hand valves prohibited between this safety valve and the pressure vessel? (g)(17)(i)

Are safety valves checked between each cook to be sure that they have not become plugged or corroded to the point of being inoperative? (g)(17)(i)

Do all safety devices conform to Paragraph U-2 in the ASME Boiler and Pressure Vessel Code, Section VIII? (g)(17)(ii)

Miscellaneous. (g)(18)

Where the processes of sulfate and soda operations are similar to those of sulfite processes, are the items in this checklist, (1) through (17) followed? (g)(18)

Are quick operating showers, bubblers, etc., available for emergency use in case of caustic soda burns? (g)(18)(i)

Are rotary tenders, smelter operators, and those cleaning smelt spouts provided with eye protection equipment, when actively engaged in their duties, in accordance with ANSI Z87.1-1968? (g)(18)(ii)

Is heavy-duty pipe, valves, and fittings used between digester and blow-pit? (g)(18)(iii)

Are these inspected at least semiannually to determine the degree of deterioration, and are they repaired or replaced when necessary? (g)(18)(iii)

Are smelt-dissolving tanks covered, and is the cover kept closed except when samples are being taken? (g)(18)(iv)

Are smelt tanks provided with vent stacks and explosion doors, in accordance with ANSI Z9.1-1951? (g)(18)(v)

Blow Lines. (g)(19)

When blow lines from more than one digester lead into one pipe, is the cock or valve of the blow line from the tank being inspected or repairs locked or tagged out, or is the line disconnected and blocked off? (g)(19)(iii)

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(g) Chemical Processes of Making Pulp.

YES NO

Furnace Room. (g)(20)

● Is exhaust ventilation provided where niter cake is fed into a rotary furnace, and is the ventilation so designed and maintained as to keep the concentration of hydrogen sulfide gas below the threshold limit as listed in 1910.1000? (g)(20)

Inspection and Repair of Tanks. (g)(21)

Is all piping leading to tanks blanked off, or is the valve locked or tagged? (g)(21)

Are any lines to sewers blanked off to protect workers from air contaminants? (g)(21)

Welding. (g)(22)

Is welding on blow tanks, accumulator tanks, or any other vessels where turpentine vapor or other combustible vapor could gather, done only after the vessel has been completely purged of fumes? (g)(22)

Is fresh air supplied workers inside of the vessels? (g)(22)

Turpentine Systems and Storage Tanks. (g)(23)

Are nonsparking tools and ground hose used when pumping out the tank? (g)(23)

Is the tank surrounded by a berm or a moat? (g)(23)

(h) Bleaching.

Bleaching Engines. (h)(1)

Are bleaching engines, except of the Bellmer type, completely covered on the top, with the exception of one small opening large enough to allow filling but too small to admit a man? (h)(1)

Do platforms leading from one engine to another have standard guardrails in accordance with ANSI A12.1-1967? (h)(1)

Bleach Mixing Rooms. (h)(2)

Is the room in which the bleach powder is mixed provided with adequate exhaust ventilation, located at the floor level, in accordance with ANSI Z9.1-1951? (h)(2)(i)

Is chlorine gas carried away from the work place and breathing area by an exhaust system? (h)(2)(ii)

Is the gas rendered neutral or harmless before being discharged into the atmosphere? (h)(2)(ii)

Are the requirements of ANSI Z9.2-1960 used in this area? (h)(2)(ii)

Are gas masks provided for emergency use, in accordance with ANSI K13.1-1967 and Z88.2-1969? (h)(2)(iii)

For emergency and rescue work, are independent self-contained oxygen masks or supplied air equipment provided? (h)(2)(iv)

Liquid Chlorine. (h)(3)

Are tanks of liquid chlorine stored in an adequately ventilated unoccupied room, where their possible leakage cannot affect workers? (h)(3)(i)

Are gas masks capable of absorbing chlorine supplied, conveniently placed and regularly inspected? (h)(3)(ii)

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(h) Bleaching.

	YES	NO
Are workers who may be exposed to chlorine gas instructed in the use of gas masks? (h)(3)(ii)		
For emergency and rescue work, are independent self-contained oxygen-type masks or supplied air equipment provided? (h)(3)(iii)		
Are at least two exits, remote from each other, provided for all rooms in which chlorine is stored? (h)(3)(iv)		
Are spur tracks upon which tank cars containing chlorine and caustic are spotted and connected to pipelines protected by means of a derail in front of the cars? (h)(3)(v)		
Are all chlorine, caustic, and acid lines marked for positive identification, in accordance with ANSI A13.1-1967? (h)(3)(vi)		
Bagged or Drummed Chemicals. (h)(4)		
Are bagged or drummed chemicals handled efficiently to prevent damage and spillage? (h)(4)		
Are oxidizing chemicals used in bleaching the pulp required to be handled with extra precautions? (h)(4)		
Are these chemicals isolated from combustible materials and other chemicals with which they will react? (h)(4)		
Are such chemicals kept dry, clean and uncontaminated? (h)(4)		
(i) Mechanical Pulp Process.		
Pulp Grinders. (i)(1)		
Are water wheels that are directly connected to pulp grinders provided with speed governors limiting the peripheral speed of the grinder to that recommended by the manufacturer? (i)(1)(i)		
Are doors of pocket grinders arranged so as to keep them from closing accidentally? (i)(1)(ii)		
Butting Saws. (i)(2)		
Are hood guards provided on butting saws, in accordance with ANSI 01.1-1954? (i)(2)		
Floors and Platforms. (i)(3)		
Are the items under (b)(3) above complied with? (i)(3)		
Personal Protection. (i)(4)		
Are persons who are exposed to falling material, required to wear eye, head, foot and shin protection equipment, in accordance with ANSI Z87.1-1968, Z88.2-1969, Z89.1-1969, and Z41.1-1967? (i)(4)		
(j) Stock Preparation.		
Pulp Shredders. (j)(1)		
Are cutting heads completely enclosed except for an opening at the feed side sufficient to permit only entry of stock? (j)(1)(i)		
Is the enclosure bolted or locked in place? (j)(1)(i)		
Is the enclosure of solid material or with mesh or other openings not exceeding one-half inch? (j)(1)(i)		

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(j) Stock Preparation.

	YES	NO
Is either a slanting feed table with its outer edge not less than 36 inches from the cutting head, or an automatic feeding device provided? (j)(1)(ii)		
Are repairs for cleaning of blockage done only when the shredder is shut down and control devices locked? (j)(1)(iii)		
Are all power-driven mechanisms guarded in accordance with the items under (b) (1) of this checklist above? (j)(1)(iv)		
Pulp Conveyors. (j)(2)		
Are pulp conveyors and conveyor drive belts and pulleys fully enclosed, or if open and within 7 feet of the floor, are they constructed and guarded in accordance with ANSI B20.1-1957? (j)(2)		
Floors, Steps, and Platforms. (j)(3)		
Do these items comply with the items under paragraph (b)(3) above? (j)(3)		
Beaters. (j)(4)		
Are beater rolls provided with covers? (j)(4)(i)		
Are guard rails at least 42 inches high provided around beaters where tub tops are less than 42 inches from the floor, in accordance with the items under (b) (3) above, and ANSI A12.1-1967? (j)(4)(ii)		
When cleaning, inspecting, or other work requires that persons enter the beaters, are all control devices locked or tagged out, in accordance with the items under (b)(4) of this section? (j)(4)(iii)		
When beaters are fed from the floor above, is the chute opening if less than 42 inches from the floor, provided with a complete rail or other enclosure? (j)(4)(iv)		
Are openings for manual feeding sufficient only for entry of stock, and are they provided with at least two permanently secured crossrails, in accordance with ANSI A12.1-1967? (j)(4)(iv)		
Are floors around beaters provided with sufficient drainage to remove wastes? (j)(4)(vi)		
Pulpers. (j)(5)		
Do all pulpers having the top or any other opening of vessel less than 42 inches from the floor or work platform, have such openings guarded by rails or other enclosures? (j)(5)(i)		
For manual charging are openings sufficient only to permit the entry of stock, and are they provided with at least two permanently secured crossrails, in accordance with ANSI A12.1-1967? (j)(5)(i)		
When cleaning, inspecting, or other work requires that persons enter the pulpers, are they equipped with safety belt and lifeline, and is one person stationed outside at a position to observe and assist in case of emergency? (j)(5)(ii)		
When cleaning, inspecting, or other work requires that persons enter pulpers, are all steam, water, or other control devices locked or tagged out? (j)(5)(iii)		
Are all power mechanisms guarded in accordance with ANSI B15.1-1953? (j)(5)(iv)		

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(j) Stock Preparation.

	YES	NO
Stock Chests. (j)(6)		
Are all control devices locked or tagged out when persons enter stock chests, in accordance with the items under (b)(4) above? (j)(6)(i)		
Are all power mechanisms guarded in accordance with items under (b)(1) of this checklist? (j)(6)(ii)		
When cleaning, inspecting, or other work requires that persons enter stock chests, are they provided with a low-voltage extension light? (j)(6)(iii)		
(k) Machine Room.		
Emergency Stops. (k)(1)		
Are paper machines equipped with devices that will stop the machine quickly in an emergency? (k)(1)		
Do the devices consist of push buttons for electric motive power, pull cords connected directly to the prime mover, control clutches, or other devices, interlocked with adequate braking action? (k)(1)		
Are such devices tested periodically by making use of them when stopping the machine, and are they so located that any person working on the machine can quickly disconnect the machine from the source of power in case of emergency? (k)(1)		
Drives. (k)(2)		
Do all drives, pulleys, couplings, and shafts on equipment requiring service while operating have standard guards in accordance with the items under (b)(1) above? (k)(2)(i)		
Are all drives provided with lockout devices at the power switch which interrupts the flow of current to the unit? (k)(2)(ii)		
Are the ends of rotating shafts including dryer drum shafts completely guarded? (k)(2)(iii)		
Are all accessible disengaged doctor blades covered? (k)(2)(iv)		
Are all exposed shafts guarded? (k)(2)(v)		
Are crossovers provided? (k)(2)(v)		
Are oil cups and grease fittings placed in a safe area remote from nip and heat hazards? (k)(2)(vi)		
Protective Equipment. (k)(3)		
Are face shields, aprons, and rubber gloves provided for workmen handling acids in accordance with the paragraphs under (b)(2) and (d)(1) of this checklist? (k)(3)		
Walkways. (k)(4)		
Do steps and footwalks along the fourdrinier and press section have nonslip surfacing, and are they equipped with standard handrails, when practical, in accordance with the items under (b)(3) of this checklist? (k)(4)		
Standard Removed by OSHA. (k)(5)		
Steps. (k)(6)		
Are steps of uniform rise and tread with nonslip surfaces provided at each press, in accordance with ANSI A12.1-1967? (k)(6)		

1910.261 – PULP, PAPER AND PAPERBOARD MILLS
(k) Machine Room.

	YES	NO
Plank Walkways. (k)(7)		
Are removable plank walkways provided along each press, with standard guardrails installed? (k)(7)		
Do planks have nonslip surfaces in accordance with the items under (b)(3) of this checklist? (k)(7)		
Dryer Lubrication. (k)(8)		
Is an automatic oiling device provided if a gear bearing must be oiled while the machine is in operation, or as an alternative, are oil cups and grease fittings placed along the walkways out of reach of hot pipes and dryer gears? (k)(8)		
Levers. (k)(9)		
Are all levers carrying weights constructed so that weights will not slip or fall off? (k)(9)		
First Dryer. (k)(10)		
Is either a permanent guardrail or apron guard or both installed in front of the first dryer in each section in accordance with the items under (b)(1) of this checklist? (k)(10)		
Steam and Hot-Water Pipes. (k)(11)		
Are all exposed steam and hot-water pipes within 7 feet of the floor or working platform, or within 15 inches measured horizontally from stairways, ramps, or fixed ladders covered with an insulating material or guarded in such manner as to prevent contact? (k)(11)		
Dryer Gears. (k)(12)		
Are dryer gears guarded, with the exception where the oilers' walkway is removed out of reach of the gears' nips and spokes and hot pipes, in accordance with ANSI B15.1-1953? (k)(12)		
Broke Hole. (k)(13)		
Is a guardrail provided at broke holes in accordance with ANSI A12.1-1967? (k)(13)(i)		
Where pulpers are located directly below the broke hole on a paper machine, and where the broke hole opening is large enough to permit a worker to fall through it are employees pushing broke down the hole required to wear a safety belt attached to a safety belt line? (k)(13)(ii)		
Is the safety belt line fastened in such a manner that it is impossible for the person to fall into the pulper? (k)(13)(iii)		
Is an alarm bell or a flashing light actuated before dropping material through the broke hole? (k)(13)(iii)		
Feeder Belt. (k)(14)		
Is a feeder belt or other effective device provided for starting paper through the calender stack? (k)(14)		
Steps. (k)(15)		
Are steps or ladders of uniform rise and tread with nonslip surfaces provided at each calender stack? (k)(15)		
Are handrails and hand grips provided at each calender stack in accordance with ANSI A12.1-1967? (k)(15)		
Grounding. (k)(16)		
Are all calender stacks and spreader bars grounded as protection against shock induced by static electricity, in accordance with the requirements of the National Electrical Code? (k)(16)		

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1910.261 – PULP, PAPER AND PAPERBOARD MILLS
(k) Machine Room.

YES NO

Sole Plates. (k)(17)

Are all exposed sole plates between dryers, calenders, reels, and rewinders equipped with a nonskid surface? (k)(17)

Nip Points. (k)(18)

Is the hazard of the nip points on all calender rolls eliminated or minimized by means of an effective barrier device, or by feeding the paper into the rolls by means of a rope carrier, air jets, or hand feeding devices? (k)(18)

Standard Removed by OSHA. (k)(19)

Scrapers. (k)(20)

Are alloy steel scrapers with pullthrough blades approximately 3 by 5 inches in size used to remove "scabs" from calender rolls? (k)(20)

Illumination. (k)(21)

Is permanent lighting installed in all areas where employees are required to make machine adjustments and sheet transfers, in accordance with ANSI A11.1-1965? (k)(21)

Control Panels. (k)(22)

Are all control panel handles and buttons protected from accidental contact? (k)(22)

Lifting Reels. (k)(24)

Do reels stop rotating before being lifted from bearings? (k)(24)(i)

Is all lifting equipment maintained in a safe condition and inspected regularly? (k)(24)(ii)

Are reel shafts with square block ends guarded? (k)(24)(iii)

Feeder Belts. (k)(25)

Are feeder belts, carrier ropes, air carriage, or other equally effective means provided for starting paper into the nip or drum-type reels? (k)(25)

Inrunning Nip. (k)(26)

Where the nipping points of all drum winders and rewinders is on the operator's side, is it guarded by barrier guards interlocked with the drive mechanism? (k)(26)(i)

1910.261 – PULP, PAPER AND PAPERBOARD MILLS
(k) Machine Room.

YES NO

Core Collars. (k)(27)

Are set screws for securing core collars to winding and unwinding shafts prohibited from protruding above the face of the collar? (k)(27)

Are all edges of the collar with which an operator's hand comes in contact beveled to remove all sharp corners? (k)(27)

Slitter Knives. (k)(28)

Are slitter knives guarded so as to prevent accidental contact? (k)(28)

Are carriers provided and used for transportation of slitter knives? (k)(28)

Winder Shaft. (k)(29)

Is the winder equipped with a guide rail to align the shaft for easy entrance into the opened rewind shaft bearing housings? (k)(29)

Core Shaft. (k)(30)

When the core shaft weighs in excess of the safe standard, is a mechanical device such as a dolly provided for carrying all or part of the weight, when it is being removed from the set of paper and placed in the dressing brackets on the winder? (k)(30)

Winder Area. (k)(31)

Is a nonskid surface provided in the front vicinity of the winder to prevent accidental slipping? (k)(31)

Radiation. (k)(32)

Where radiation hazards exist, are the items under 1910.96 of this checklist posted and followed? (k)(32)

(l) Finishing Room.

Cleaning Rolls. (l)(1)

Are rolls cleaned only on the outrunning side? (l)(1)

Emergency Stops. (l)(2)

Are electrically or manually operated quick power disconnecting devices, interlocked with braking action, provided on all operating sides of the machine within easy reach of all employees? (l)(2)

Are these devices tested by making use of them when stopping the machine? (l)(2)

Core Collars. (l)(3)

Are the requirements of the items under (k)(17) of this section and ANSI B15.1-1953 used in this area? (l)(3)

Elevators. (l)(4)

Are elevators in accordance with ANSI 17.1-1965? (l)(4)

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Control Panels. (l)(5)

Are the requirements of items under (k)(22) of this section complied with? (l)(5)

Guillotine-Type Cutters. (l)(6)

Is each guillotine-type cutter equipped with a control which requires the operator and his helper, if any, to use both hands to engage the clutch? (l)(6)(i)

Is each guillotine-type cutter equipped with a nonrepeat device? (l)(6)(ii)

Are carriers provided and used for the transportation of guillotine-type cutter knives? (l)(6)(iii)

Rotary Cutter. (l)(7)

On single-knife machines is a guard provided at the point of contact to the knife? (l)(7)(i)

On duplex cutters, is the protection required for single-knife cutters provided for the first knife, and is a hood provided for the second knife? (l)(7)(ii)

Is safe access provided to the knives of a rotary cutter by means of catwalks with nonslip surfaces, railings, and toeboards in accordance with the items under (b)(3) of this checklist? (l)(7)(iii)

Is a guard provided for the spreader or squeeze roll at the nip side on sheet cutters? (l)(7)(iv)

Are electrically or manually operated quick power disconnecting devices with adequate braking action provided on all operating sides of the machine within easy reach of all operators? (l)(7)(v)

Are all outside slitters guarded? (l)(7)(vi)

Platers. (l)(8)

Is a guard arranged across the face of the rolls to serve as a warning that the operator's hand is approaching the danger zone? (l)(8)(i)

Is a quick power disconnecting device installed on each machine within easy reach of the operator? (l)(8)(ii)

Finishing Room Rewinders. (l)(9)

Are the nipping points of all drum winders and rewinders located on the operator's side guarded by either automatic or manually operated barrier guards of sufficient height to protect fully anyone working around them? (l)(9)(i)

Is the barrier guard interlocked with the drive mechanism to prevent operating above jog speed without the guard in its place? (l)(9)(i)

Is a zero speed switch installed to prevent the guard from being raised while the roll is turning? (l)(9)(i)

Is a nonskid surface provided in front of the rewinder to prevent an employee from slipping, in accordance with the items under (b)(3) of this checklist? (l)(9)(ii)

Are mechanical lifting devices provided for placing and removing rolls from the machine? (l)(9)(iii)

Roll-Type Embosser. (l)(10)

Is the nipping point located on the operator's side guarded by either automatic or manually operated barrier guards interlocked with the drive? (l)(10)

Control Panels. (l)(11)

Are the requirements of the items under paragraph (k)(22) of this checklist complied with? (l)(11)

Sorting and Counting Tables. (l)(12)

Are tables smooth and free from splinters, with edges and corners rounded? (l)(12)(i)

Are paddles smooth and free from splinters? (l)(12)(ii)

Roll Splitters. (l)(13)

Is the nip point and cutter knife guarded by either automatic or manually operated barrier guards? (l)(13)

(m) Materials Handling.

Hand Trucks. (m)(1)

Are employees prohibited from riding on a powered hand truck unless it is so designed by the manufacturer? (m)(1)

Is a limit switch provided on the operating handle – 30 degrees each way from a 45-degree angle up and down? (m)(1)

Power Trucks. (m)(2)

Do power trucks comply with ANSI B56.1-1969? (m)(2)

Is adequate ventilation provided and are the trucks properly maintained, so that dangerous concentrations of carbon monoxide cannot be generated, especially in warehouses or other isolated areas of a plant? (m)(2)

Cartons. (m)(3)

Are carton-stitchers guarded to prevent the operator from coming in contact with the stitching head of the machine? (m)(3)

Banding of Skids, Cartons, Cases, etc. (m)(4)

(i) Do banders and their helpers wear eye protection equipment?
(ii) Is the eye protection equipment in accordance with the items under paragraph (b)(2) of this checklist? (m)(4)

Unloading Cars or Trucks. (m)(5)

Where steel bands or wires are used in boxcars or trucks, are all loaders and helpers required to wear eye protection in accordance with items under (b)(2) of this checklist? (m)(5)(i)

Does the construction and use of bridge or dock plates conform to the requirements of ANSI B56.1-1969? (m)(5)(ii)

Are flag signals, derails, or other protective devices used to protect men during switching operations? (m)(5)(iii)

Is the blue flag policy invoked according to the items under (c)(9)(i) of this checklist? (m)(5)(iii)

YES NO

(a) Applications Requirements.

Application. (a)(1)

The requirements of this checklist for textile safety apply to the design, installation, processes, operation, and maintenance of textile machinery, equipment, and other plant facilities in all plants engaged in the manufacture and processing of textiles, except those processes used exclusively in the manufacture of synthetic fibers. (a)(1)

(c) General Safety Requirements.

Means of Stopping Machines. (c)(1)

Is every textile machine provided with individual mechanical or electrical means for stopping such machines? (c)(1)

On machines driven by belts and shafting, is a locking-type shifter or an equivalent positive device used? (c)(1)

On operations where injury to the operator might result if motors were to restart after power failures, are provisions made to prevent machines from automatically restarting upon restoration of power? (c)(1)

Handles. (c)(2)

Are starting and stopping handles designed to the proper length to prevent the worker's hand or fingers from striking against any revolving part, gear guard, or any other part of the machine? (c)(2)

Machine Guarding. (c)(3)

Does mechanical power-transmission equipment comply with the guarding requirements in this checklist under 1910.219? (c)(3)

Housekeeping. (c)(4)

Are aisles and working spaces kept in good order, clean and free of obstructions in accordance with the requirements of 1910.219 of this checklist? (c)(4)

Inspection and Maintenance. (c)(5)

Are all guards and other safety devices, including starting and stopping devices, properly maintained? (c)(5)

Lighting. (c)(6)

Does lighting conform to ANSI A11.1-1965? (c)(6)

Identification of Piping Systems. (c)(7)

Does identification of piping systems conform to ANSI A13.1-1956? (c)(7)

Identification of Physical Hazards. (c)(8)

Is the identification of physical hazards in accordance with the requirements of 1910.144 of this checklist? (c)(8)

Steam Pipes. (c)(9)

Are all pipes carrying steam or hot water for process or servicing machinery, when exposed to contact and located within 7 feet of the floor or working platform, covered with a heat-insulating material, or otherwise properly guarded? (c)(9)

(d) Openers and Pickers.

Beater Guards. (d)(1)

When any opening or picker machinery is equipped with a beater, are such beaters provided with metal covers which will prevent contact with the beater? (d)(1)

(d) Openers and Pickers.

YES NO

Are such covers provided with an interlock which will prevent the cover from being raised while the machine is in motion, and prevent the operation of the machine while the cover is open? (d)(1)

Cleanout Holes. (d)(2)

Are cleanout holes within reaching distance of the fan or picker beater equipped with covers securely fastened that cannot be opened while the machine is in motion? (d)(2)

Feed Rolls. (d)(3)

Are the feed rolls on all opening and picking machinery covered with a guard designed to prevent the operator from reaching the nip while the machinery is in operation? (d)(3)

Removal of Foreign Ferrous Material. (d)(4)

Are all textile opener lines equipped with magnetic separators, tramp iron separators, or other means for the removal of foreign ferrous material? (d)(4)

(e) Cotton Cards.

Enclosures. (e)(1)

Are cylinder and lickerins completely protected, and are the doffers enclosed? (e)(1)

Enclosure Fastenings. (e)(2)

Are the enclosures or covers kept in place while the machine is in operation, except when stripping or grinding? (e)(2)

Stripping Rolls. (e)(3)

On operations calling for flat strippings which are allowed to fall on the doffer cover, and where such strippings are removed by hand, is the doffer cover kept closed and securely fastened to prevent the opening of the cover while the machine is in operation? (e)(3)

When it becomes necessary to clean the cards while they are in motion, is a long-handled brush or dust mop used? (e)(3)

(f) Garnett Machines.

Lickerin. (f)(1)

Are Garnett lickerins enclosed? (f)(1)

Fancy Rolls. (f)(2)

Are Garnett fancy rolls enclosed by covers? (f)(2)

Are they installed in a way that keeps worker rolls reasonably accessible for removal or adjustment? (f)(2)

Underside of Machine. (f)(3)

Is the underside of the garnett guarded by a screen mesh or other form of enclosure to prevent access? (f)(3)

(g) Spinning Mules.

Is a substantial fender of metal or hardwood installed in front of the carriage wheels? (g)

Does such fender extend to within one-fourth inch of the rail? (g)

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	YES	NO
(h) Slashers.		
Cylinder Dryers. (h)(1) *Reducing Valves, Safety Valves, and Pressure Gages.* (h)(1)(i)		
Do reducing valves, safety valves, and pressure gages conform to the ASME Pressure Vessel Code, Section VIII? (h)(1)(i)		
Vacuum Relief Valves. (h)(1)(ii)		
Do vacuum relief valves conform to the ASME Code for Pressure Vessels, Section VIII? (h)(1)(ii)		
Lever Control. (h)(1)(iii)		
When slashers are operated by control levers, are these levers connected to a horizontal bar or treadle located not more than 69 inches above the floor to control the operation from any point? (h)(1)(iii)		
Pushbutton Control. (h)(1)(iv)		
Do slashers operated by pushbutton control have stop and start buttons located at each end of the machine, with additional buttons located on both sides of the machine at the size box and the delivery end? (h)(1)(iv)		
If calender rolls are used, are additional buttons provided at both sides of the machine at points near the nips, except when slashers are equipped with an enclosed dryer, which follows in normal sequence? (h)(1)(iv)		
Nip Guards. (h)(1)(v)		
Do all nip guards comply with the requirements of the items under (2)(iv) of this checklist? (h)(1)(v)		
Cylinder Enclosure. (h)(1)(vi)		
When enclosures or hoods are used over cylinder drying rolls, are such enclosures or hoods provided with an exhaust system which will effectively prevent wet air and steam from escaping into the workroom? (h)(1)(vi)		
Expansion Chambers. (h)(1)(vii)		
Are slasher kettles and cookers provided with expansion chambers in the covers, or drains, to prevent surging over? (h)(1)(vii)		
Are steam-control valves located so that they can be operated without exposing the worker to moving parts, hot surfaces, or steam? (h)(1)(vii)		
Enclosed Hot Air Dryer. (h)(2) *Lever Control.* (h)(2)(i)		
When slashers are operated by control levers, are these levers connected to a horizontal bar or treadle located not more than 69 inches above the floor to control the operation from any point? (h)(2)(i)		
Push-Button Control. (h)(2)(ii)		
Do slashers that are operated by pushbutton control have one start button at each end of the machine and stop buttons located on both sides of the machines at intervals spaced not more than 6 feet on centers? (h)(2)(ii)		
Are inching buttons installed? (h)(2)(ii)		
Dryer Enclosure. (h)(2)(iii)		
Is the dryer enclosure provided with an exhaust system which will effectively prevent wet air and steam from escaping into the workroom? (h)(2)(iii)		

	YES	NO
Nip Guards. (h)(2)(iv)		
Is Table R-1 (see Appendix) used in determining the proper nip guards? (h)(2)(iv)		
Expansion Chambers. (h)(2)(v)		
Are slasher kettles and cookers provided with expansion chambers in the covers, or drains, to prevent surging over? (h)(2)(v)		
Are steam control valves so located that they can be operated without exposing the worker to moving parts, hot surfaces, or steam? (h)(2)(v)		
(i) Warpers.		
Swiveled Double-Bar Gates. (i)(1)		
Are swiveled double-bar gates installed on all warpers operating in excess of 450 yards per minute? (i)(1)		
Are these gates so interlocked that the machine cannot be operated until the gate is in the "closed position," except for the purpose of inching or jogging? (i)(1)		
Closed Position. (i)(2) The term "closed position" as used above means that the top bar of the gate shall be at least 42 inches from the floor or working platform; and the lower bar shall be at least 21 inches from the floor or working platform; and the gate shall be located 15 inches from the vertical tangent to the beam head. (i)(2)		
(j) Drawing Frames, Slubbers, Roving Parts, Cotton Combers, Ring Spinning Frames, Twisters.		
Are gear housing covers on all installations of drawing frames, slubbers, roving frames, cotton combers, ring spinning frames, and twisters equipped with interlocks? (j)		
(k) Gill Boxes.		
Pin Guard. (k)(1)		
Is a guard placed ahead of the feed end and is it so designed that it will prevent the worker's fingers from being caught in the pins of the intersecting fallers? (k)(1)		
Nip Guards. (k)(2)		
Do nip guards comply with the requirements in the items under (h)(2)(iv) of this section? (k)(2)		
(l) Heavy Draw Boxes, Finishers, and Speeders Used in Worsted Drawing.		
Band Pulley Covers. (l)(1)		
Are covers for band pulleys closed when the machine is in motion? (l)(1)		
Benches or Working Platforms. (l)(2)		
Are benches or working platforms approximately 10 inches in height and 8 inches in width installed along the entire running length of the machine for the worker to stand on while creeling the machine? (l)(2)		
Are such benches or platforms covered with an abrasive or nonslip material? (l)(2)		

YES NO

(m) Silver and Ribbon Lappers (cotton).

Cover Guard. (m)(1)

Is an interlocking cover guard installed over the large calender drums and the lap spool, and is it designed to prevent the operator from coming in contact with the nip? (m)(1)

(n) Looms.

Shuttle Guard. (n)(1)

Is each loom equipped with a guard designed to minimize the danger of the shuttle flying out of the shed? (n)(1)

Protection for Loom Fixer. (n)(2)

Are provisions made so that every loom fixer can prevent the loom from being started while he is at work on the loom? (n)(2)

Is this accomplished by means of a lock, the key to which is retained in the possession of the loom fixer, or by some other effective means to prevent starting the loom? (n)(2)

(o) Shearing Machines.

Are all revolving blades on shearing machines guarded so that the opening between the cloth surface and the bottom of the guard will not exceed three-eighths inch? (o)

(p) Continuous Bleach Range (cotton and rayon).

J-Box Protection. (p)(1)

Is each valve controlling the flow of steam, injurious gases, or liquids into a J-box equipped with a chain, lock, and key, so that any worker who enters the J-box can lock the valve and retain the key in his possession? (p)(1)

Open-Width Bleaching. (p)(2)

Is the nip of all in-running rolls on open-width bleaching machine rolls protected with a guard to prevent the worker from being caught at the nip? (p)(2)

Does the guard extend across the entire length of the nip? (p)(2)

(q) Kiers.

Reducing Valves, Safety Valves, and Pressure Gages. (q)(1)

Do reducing valves, safety valves and pressure gages conform to the ASME Code for Unfired Pressure Vessels, Section VIII? (q)(1)

Kier Valve Protection. (q)(2)

Is each valve controlling the flow of steam, injurious gases, or liquids into a kier equipped with a chain, lock, and key so that any worker who enters the kier can lock the valve and retain the key in his possession? (q)(2)

(r) Gray and White Bins.

Are guardrails conforming to 1910.23 provided where workers are required to plait by hand from the top of the bin, so as to protect the worker from falling to a lower level? (r)

(s) Mercerizing Range (piece goods).

Stopping Devices. (s)(1)

Is a stopping device provided at each end of the machine? (s)(1)

(s) Mercerizing Range (piece goods).

YES NO

Frame Ends. (s)(2)

Is a guard installed at each end of the frame between the in-running chain and the clip opener, to prevent the worker's fingers from being caught? (s)(2)

Mangle and Washers. (s)(3)

Does the nip at the in-running rolls conform to 1910.264, which follows in normal sequence? (s)(3)

(t) Tenter Frames.

Stopping Devices. (t)(1)

Is a stopping device provided at each end of the machine? (t)(1)

Frame Ends. (t)(2)

Is a guard installed at each end of the frame at the in-running chain and clip opener? (t)(2)

Oil Cups. (t)(3)

Are oil cups safely located to permit easy access? (t)(3)

(u) Dyeing Jigs.

Stopping Devices. (u)(1)

Is each dye jig equipped with individual mechanical or electrical means for stopping the machine? (u)(1)

Roll Arms. (u)(2)

Are roll arms on jigs built to allow for extra large batches, and to prevent the center bar from being forced off, causing the batch to fall? (u)(2)

(v) Padders – Nip Guards.

Do all nip guards comply with the requirements of the items under (h)(2)(iv) of this checklist above? (v)

(w) Drying Cans.

Pressure Reducing Valves and Pressure Gages. (w)(1)

Do pressure reducing valves and pressure gages conform to the ASME Code for Pressure Vessels, Section VIII? (w)(1)

Vacuum Collapse. (w)(2)

If cans are not designed to prevent vacuum collapse, is each can equipped with one or more vacuum relief valves with openings of sufficient size to prevent the collapse of the can if vacuum occurs? (w)(2)

(x) Flat-Work Ironer.

Feed Rolls. (x)(1)

Are the feed rolls guarded in accordance with the items under 1910.264 of this checklist? (x)(1)

Pressure Rolls. (x)(2)

Are pressure rolls covered or guarded to conform to 1910.264 of this checklist? (x)(2)

(y) Extractors.

Centrifugal Extractor. (y)(1)

Cover. (y)(1)(i)

Is each extractor equipped with a metal cover? (y)(1)(i)

YES NO

(y) Extractors.

Interlocking Device. (y)(1)(ii)

Is each extractor equipped with an interlocking device that will prevent the cover from being opened while the basket is in motion, and also prevent the power operation of the basket while the cover is open? (y)(1)(ii)

Brakes. (y)(1)(iii)

Is each extractor equipped with a mechanically or electrically operated brake to quickly stop the basket when the power driving the basket is shut off? (y)(1)(iii)

Maximum Allowable Speed. (y)(1)(iv)

Is each centrifugal extractor effectively secured in position on the floor or foundation so as to eliminate unnecessary vibration? (y)(1)(iv)

Are precautions taken to insure that the extractor will not be operated at a speed greater than the manufacturer's rating, which must be stamped where easily visible in letters not less than one-quarter inch in height? (y)(1)(iv)

Is the maximum allowable speed given in revolutions per minute (rpm)? (y)(1)(iv)

Engine Drum Extractor. Overspeed Governor. (y)(2)

Is each engine individually driving an extractor provided with an approved engine stop and speed limit governor? (y)(2)

Squeezer or Wringer Extractor - Nip Guards. (y)(3)

Are all nip guards in compliance with the requirements under (h)(2)(iv) of this checklist? (y)(3)

(z) Nip Guards.

Are all nip guards for water mangle, starch mangle, backwasher (worsted yarn) crabbing machines, decating machines, in compliance with the items under (h)(2)(iv)? (z)

(aa) Sanforizing and Palmer Machine.

Is a safety triprod, cable, or wire center cord provided across the front and back of all palmer cylinders extending the length of the face of the cylinder? (aa)

Does such device operate readily whether pushed or pulled? (aa)

(bb) Rope Washers.

Splash Guard. (bb)(1)

Are splash guards installed on all rope washers unless the machine is so designed as to prevent the water or liquid from splashing the operator, the floor, or working surface? (bb)(1)

Safety Stop Bar. (bb)(2)

Is a safety triprod, cable or wire center cord provided across the front and back of all rope washers extending the length of the face of the washer? (bb)(2)

Does it operate readily whether pushed or pulled? (bb)(2)

YES NO

(cc) Laundry Washer Tumbler or Shaker.

Interlocking Device. (cc)(1)

Is each drying tumbler, each double cylinder shaker or clothes tumbler, and each washing machine equipped with an interlock device which will prevent the power operation of the inside cylinder when the outer door on the case or shell is open? (cc)(1)

Does this device also prevent the outer door on the case or shell from being opened without shutting off the power? (cc)(1)

Means of Holding Covers or Doors in Open Position. (cc)(2)

Is each enclosed barrel also equipped with adequate means for holding open the doors or covers of the inner and outer cylinders or shells while it is being loaded or unloaded? (cc)(2)

(dd) Printing Machine (roller type).

Nip Guards. (dd)(1)

Do all nip guards comply with the items under (h)(2)(iv) of this checklist? (dd)(1)

Crown Wheel and Roller Gear Nip Protection. (dd)(2)

Are the engraved roller gears and the large crown wheel provided with a protective disc which will enclose the nips of the in-running gears? (dd)(2)

(ee) Calenders.

Is the nip at the in-running side of the rolls provided with a guard extending across the entire length of the nip and arranged to prevent the fingers of the workers from being pulled in between the rolls or between the guard and the rolls, and are they constructed so that the cloth can be fed into the rolls safely? (ee)

(ff) Rotary Staple Cutters.

Is a guard installed completely enclosing the cutters to prevent the hands of the operator from reaching the cutting zone? (ff)

(gg) Clothing Folding Machine.

Is the crank arm and blade guide rods on both sides of the cloth-folding machines protected from contact by barrier guards constructed to conform to the items under 1910.219 of this checklist? (gg)

(hh) Hand Bailing Machine.

Is an angle-iron-handle stop guard installed at the right angle to the frame of the machine? (hh)

Is the stop guard so designed and so located that it will prevent the handle from traveling beyond the vertical position should the handle slip from the operator's hand when the pawl has been released from the teeth of the takeup gear? (hh)

YES NO

(ii) Roll Bench.

Are cleats installed on the ends of roll benches? (ii)

(jj) Cuttle or Swing Folder (overhead type)

Is the bottom of the overhead folders located not less than 7 feet from the floor or working surface? (jj)

(kk) Color-Mixing Room.

Are floors in color-mixing rooms constructed to drain easily? (kk)

(ll) Open Tanks and Vats for Mixing and Storage of Hot or Corrosive Liquids.

Protection Against Falls. (ll)(1)

Are open tanks and vats containing hot or corrosive liquids protected to conform to the requirements of this checklist under 1910.23? (ll)(1)

Shutoff Valves. (ll)(2)

Where boiling tanks, caustic tanks, and hot liquid containers are located that the operator cannot see the contents from the floor or working area, are there emergency shutoff valves that are controlled from a point not subject to danger of splash? (ll)(2)

Do valves conform to the ASME Pressure Vessel Code, Section VIII? (ll)(2)

(mm) Dye Kettles and Vats.

Are pipes or drains of sufficient capacity to carry the contents safely away from the working area installed where there are dye kettles and vats which may at any time contain hot or corrosive liquids? (mm)

Are these drains prohibited from emptying directly onto the floor? (mm)

(nn) Acid Carboys.

Are carboys provided with inclinators, or is the acid withdrawn from the carboys by means of pumping without pressure in the carboy, or by means of hand operated siphons? (nn)

(oo) Handling Caustic Soda and Caustic Potash.

Are means provided for handling and emptying caustic soda and caustic potash containers to prevent workers from coming in contact with the caustic? (oo)

NOTE: See paragraph (qq) of this section.

(pp) First Aid.

Wherever acids or caustics are used, are provisions made for a copious and flowing supply of fresh, clean water? (pp)

(qq) Personal Protective Equipment.

Personal Protective Equipment. (qq)(1)

Are workers who are engaged in handling acids or caustics in bulk, repairing pipe lines containing acids or caustics, etc., provided with protective occupational (safety) equipment to conform to the items under 1910.132, 1910.133, and 1910.134 of this checklist? (qq)(1)

YES NO

Are respirators, gas masks, and such appliances, for emergency use, of a type required by 1910.134 of this checklist? (qq)(2)

(rr) Workroom Ventilation.

In all workrooms in which potentially toxic substances are used, are the threshold limit values as listed in 1910.1000 maintained? (rr)

Do open surface tanks conform to the requirements of 1910.94(d)? (rr)

1910.263 – BAKERY EQUIPMENT

(a) General Requirements.

Application. (a)(1)

The requirements of this section shall apply to the design, installation, operation and maintenance of machinery and equipment used within a bakery. (a)(1)

Standards Incorporated by Reference. (a)(2)

Standards covering issues of occupational safety and health which are of general application without regard to any specific industry are incorporated by reference in paragraphs of this section and made applicable to bakeries. All such standards shall be construed according to the rules of construction set out in 1910.5. (a)(2)

(c) General Machine Guarding.

Gears. (c)(2)

Are all gears completely enclosed regardless of location? (c)(2)

Sprockets and V-Belt Drives. (c)(3)

Are sprockets and V-belt drives located within reach from platforms or passageways, or located within 8 feet 6 inches from the floor, completely enclosed? (c)(3)

Lubrication. (c)(5)

Where machinery must be lubricated while in motion, are stationary lubrication fittings inside a machine provided with extension piping to a point of safety so that the employee will not have to reach into any dangerous part of the machine when lubricating? (c)(5)

Hot Pipes. (c)(8)

Are exposed hot water and steam pipes covered with insulating material wherever necessary to protect employees from contact? (c)(8)

(d) Flour-Handling Equipment.

General Requirements for Flour Handling. (d)(1)

Wherever any of the various pieces of apparatus comprising a flour-handling system are run in electrical unity with one another are the following safeguards complied with:

(b) Wherever a flour-handling system is of such size that the beginning of its operation is far remote from its final delivery end, are all electric motors operating each apparatus comprising this system controlled at each of two points, one located at each remote end, either of which will stop all motors?
(d) Are control circuits for magnetic controllers so arranged that the opening of any one of several limit switches, which may be on an individual unit, will serve to de-energize all the motors of that unit? (d)(1)(i)

Are removable covers on all flour-handling equipment so designed that the lifting effort will not be more than 50 pounds? (d)(1)(ii)

Bag Chutes and Bag Lifts. (d)(2)

Are bag chutes so designed as to keep to a minimum the speed of flour bags? (d)(2)(i)

If the chute inclines more than 30° from the horizontal, is there an upturn at the lower end of the chute to slow down the bags? (d)(2)(i)

Are bag-arm elevators with manual takeoff designed to operate at a capacity not exceeding 7 bags per minute? (d)(2)(ii)

Are the arms on the conveyor chain so spaced as to obtain the full capacity of the elevator with the lowest possible chain speed? (d)(2)(ii)

Is there an electric limit switch at the unloading end of the bag-arm elevator so installed as to automatically stop the conveyor chain if any bag fails to clear the conveyor arms? (d)(2)(ii)

Are man lifts prohibited from being used in bakeries? (d)(2)(iv)

Are bag or barrel lifts prohibited from being used as man lifts? (d)(2)(iv)

Dumpbin and Blender. (d)(3)

Are all dumpbin and blender hoods of sufficient capacity to prevent circulation of flour dust outside the hoods? (d)(3)(v)

Are all dumpbins of a suitable height from the floor to enable the operator to dump flour from bags without causing undue strain or fatigue? (d)(3)(vi)

Where the edge of any bin is more than 24 inches above the floor, is a bag rest step provided? (d)(3)(vi)

Is a control device for stopping the dumpbin and blender provided close to the normal location of the operator? (d)(3)(vii)

Storage Bins. (d)(6)

Are storage bins provided with gaskets and locks or latches to keep the cover closed, or other equivalent devices in order to insure the dust tightness of the cover? (d)(6)(ii)

Are covers at openings where an employee may enter a bin also provided with a hasp and a lock, so located that the employee may lock the cover in the open position whenever it is necessary for him to enter the bin? (d)(6)(ii)

Are storage bins where the side is more than 5 feet in depth provided with standard stationary ladders, both inside and outside, to reach from floor level to the top of the bin and from top of the bin to inside bottom, keeping the ladder end away from the moving screw conveyor? (d)(6)(iii)

Is the main entrance cover of large storage bins located at the interior exit ladder provided with an electric interlock for motors operating both feed and unloading screw, so that these motors cannot operate while the cover is open? (d)(6)(vi)

Screw Conveyors. (d)(7)

Are the covers of all screw conveyors made removable in convenient sections, and are they held on with stationary clamps located at proper intervals keeping all covers dust-tight? (d)(7)(iii)

Sifters. (d)(8)

Are enclosures of all types of flour sifters constructed so that they are dust-tight but readily accessible for interior inspection? (d)(8)(i)

Flour Scales. (d)(9)

Are traveling or track-type flour scales equipped with bar handles for moving same? (d)(9)(iii)

Is this bar at least 1 inch in diameter and well away from trolley track wheels? (d)(9)(iii)

(e) Mixers.

Horizontal Dough Mixers. (e)(1)

Do mixers with external power application have all belts, chains, gears, pulleys, sprockets, clutches and other moving parts completely enclosed? (e)(1)(i)

Is each mixer equipped with an individual motor and control, and with a conveniently located manual switch to prevent the mixer from being started in the usual manner while the machine is being serviced and cleaned? (e)(1)(iii)

Are all electrical control stations so located that the operator must be in full view of the bowl in its open position? (e)(1)(iv)

Is duplication of such controls other than a stop switch prohibited? (e)(1)(iv)

Are all mixers with power and manual dumping arrangements equipped with safety devices which:

(a) Engage both hands of the operator when the agitator is in motion under power, and while the bowl is opened more than one-fifth of its total opening;
(b) Prevent the agitator from being started while the bowl is more than one-fifth open, without engaging both hands of the operator? (e)(1)(v)

1910.263 – BAKERY EQUIPMENT

(e) Mixers.

	YES	NO
Is every mixer equipped with a full enclosure over the bowl which is closed at all times while the agitator is in motion? (e)(1)(viii)		
Are only minor openings in this enclosure, such as ingredient doors, flour inlets, etc., each representing 1½ square feet in area, capable of being opened while the mixer is in operation? (e)(1)(viii)		
Are overhead covers or doors which are subject to accidental closure counterbalanced to remain in an open position, or provided with means to hold them open until positively released by the operator? (e)(1)(x)		
Are valves and controls to regulate the coolant in mixer jackets located so as to permit access by the operator without jeopardizing his safety? (e)(1)(xviii)		
Vertical Mixers. (e)(2)		
Do vertical mixers comply with the items under (i) and (iii) in subparagraph (1) above? (e)(2)(i)		
Are bowl locking devices of a positive type which require the attention of the operator for unlocking? (e)(2)(iii)		
Are devices available for moving bowls weighing more than 80 pounds, with contents, into and out of the mixing position on the machine? (e)(2)(iv)		
(f) Dividers. Dividers.		
Rear of Divider. (f)(3)		
Does the back of the divider have a complete cover to enclose all of the moving parts, or is each individual part enclosed or guarded to remove the separate hazards? (f)(3)		
Is the rear cover provided with a limit switch in order that the machine cannot operate when this cover is open? (f)(3)		
Knife Actuating Arm. (f)(5)		
Is there a saddle guard or other protective device on any elongated hole in the knife actuating arm at the back of the divider? (f)(5)		
Shear Pins. (f)(6)		
Are dividers equipped with mechanical overload release devices such as shear pins? (f)(6)		
(g) Moulders.		
Hoppers. (g)(1)		
Are mechanical feed moulders provided with hoppers so designed and connected to the proofer that an employee's hands cannot get into the hopper where they will come in contact with the in-running rolls? (g)(1)		
Hand-Fed Moulders. (g)(2)		
Are hand-fed moulders provided with a belt-feed device, or is the hopper extended high enough so that the hands of the operator cannot get into the feed rolls? (g)(2)		
Is the top edge of such a hopper well rounded to prevent injury when it is struck or bumped by the employee's hands? (g)(2)		
Stopping Devices. (g)(3)		
Is there a stopping device within easy reach of the operator who feeds the moulder, and another stopping device within the reach of the employee taking the dough away from the moulder? (g)(3)		

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	YES	NO
(h) Manually-Fed Dough Brakes.		
Top-Roll Protection. (h)(1)		
Is the top roll protected by a heavy gage metal shield extending over the roll to go within 6 inches of the hopper bottom board? (h)(1)		
Emergency Stop Bar. (h)(2)		
Is an emergency stop bar provided, and so located that the body will press against it if the operator slips and falls toward the rolls, or if the operator gets his hand caught in the rolls? (h)(2)		
Does the bar apply the body pressure positively to open a circuit which will deenergize the drive motor? (h)(2)		
In addition, is a brake which is inherently self-engaging by requiring power or force from an external source to cause disengagement, activated at the same time causing the rolls to stop instantly? (h)(2)		
Is the emergency stop bar checked every 30 days? (h)(2)		
(i) Miscellaneous Equipment.		
Proof Boxes. (i)(1)		
Are all door locks operable both from within and outside the box? (i)(1)		
Are guide rails installed to center the rack as it enters, passes through, and leaves the proof box? (i)(1)		
Fermentation Room. (i)(2)		
Do fermentation room doors have non-shatterable wire glass or plastic panels for vision through doors? (i)(2)		
Troughs. (i)(3)		
Are troughs mounted on antifriction bearing casters, thus making it possible for the operator to move and direct the motion of the trough with a minimum of effort? (i)(3)		
Hand Trucks. (i)(4)		
Are casters set back from corners to be out of the way of toes and heels, but not far enough back to cause the truck to be unstable? (i)(4)(i)		
Is a lock or other device provided to hold the handle in vertical position when the truck is not in use? (i)(4)(ii)		
Lift Trucks. (i)(5)		
Is a lock or other device provided to hold the handle in vertical position when the truck is not in use? (i)(5)		
Racks. (i)(6)		
Are racks equipped with handles so located with reference to the frame of the rack that no part of the operator's hands extend beyond the outer edge of the frame when holding onto the handles? (i)(6)(ii)		
Are antifriction bearing casters used to give the operator better control of the rack? (i)(6)(iii)		
Conveyors. (i)(7)		
Wherever a conveyor passes over a main aisleway, regularly occupied work area, or passageway, is the underside of the conveyor completely enclosed to prevent broken chains or other material from falling in the passageway? (i)(7)(i)		

1910.263 – BAKERY EQUIPMENT
(i) Miscellaneous Equipment.

YES NO

Are stop bumpers installed on all delivery ends of the conveyor wherever manual removal of the product carried is practiced? (i)(7)(ii)

Where hazard of getting caught exists, are a sufficient number of stop buttons provided to enable quick stopping of the conveyor? (i)(7)(iii)

Ingredient Premixers, Emulsifiers, etc. (i)(11)

Are all top openings provided with covers attached to the machines? (i)(11)(i)

Are these covers so arranged and interlocked that power will be shut off whenever the cover is opened to a point where the operator's fingers might come in contact with the beaters? (i)(11)(i)

Chain Tackle. (i)(12)

Is all chain tacke marked prominently, permanently, and legibly with minimum support specification? (i)(12)(i)

Is all chain tackle marked prominently, permanently, and legibly with maximum load capacity? (i)(12)(ii)

Are safety hooks used? (i)(12)(iii)

Trough Hoists, etc. (i)(13)

Are all hoists marked prominently, permanently, and legibly with maximum load capacity? (i)(13)(i)

Are all hoists marked permanently and legibly with minimum support specifications? (i)(13)(ii)

Are safety catches provided for the chain so that the chain will hold the load in any position? (i)(13)(iii)

Are safety hooks used? (i)(13)(iv)

Air-Conditioning Units. (i)(14)

On large units with doors to chambers large enough to be entered, are all door locks operable from both inside and outside? (i)(14)(ii)

Pan Washing Tanks. (i)(15)

Is the surface of the floor of the working platform maintained in a nonslip condition? (i)(15)(ii)

Are power ventilated exhaust hoods provided over the tanks? (i)(15)(v)

Bread Coolers, Conveyor Type. (i)(19)

Are stop bumpers on all delivery ends of conveyors installed wherever manual removal of the product carried is practiced? (i)(19)(ii)

Bread Coolers, Rack Type. (i)(20)

Are guardrails installed to the center rack as it enters and leaves the cooler? (i)(20)(i)

Are all door locks operable from both within and outside the cooler? (i)(20)(ii)

Bread and Cake Boxes, Trays, etc. (i)(21)

Are sharp corners and edges eliminated on metal parts? (i)(21)(i)

Are all wooden corners and edges protected to prevent splinters? (i)(21)(ii)

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(i) Miscellaneous Equipment.

YES NO

Doughnut Machines. (i)(22)

Are separate flues provided, (i) for venting vapors from the frying section, and (ii) for venting products of combustion from the combustion chamber used to heat the fat? (i)(22)

Open Fat Kettles. (i)(23)

Is the floor around kettles maintained in nonslip condition? (i)(23)(i)

Is the top of the kettle at least 36 inches above floor or working level? (i)(23)(iv)

Steam Kettles. (i)(24)

Are positive locking devices provided to hold kettles in the desired position? (i)(24)(i)

Are kettles with steam jackets provided with safety valves in accordance with the ASME Pressure Vessel Code, Section VIII? (i)(24)(ii)

(j) Slicers and Wrappers.

Slicers. (j)(1)

Is the cover over the knife head of reciprocating-blade slicers provided with an interlocking arrangement so that the machine cannot operate unless the cover is in place? (j)(1)(iii)

On slicers with endless band knives, is each motor equipped with a magnet brake which operates whenever the motor is not energized? (j)(1)(iv)

Is each door, panel, or other point of access to the cutting blades arranged by means of mechanical or electric interlocks so that the motor will be deenergized if all such access doors, panels, or access points are not closed? (j)(1)(iv)

When it is necessary to sharpen slicer blades on the machine, is a barrier provided leaving only sufficient opening for the sharpening stone to reach the knife blades? (j)(1)(v)

Slicer Wrapper Conditions. (j)(1)(vii)

(c) Are mechanical control levers for starting and stopping both slicing machine conveyors and wrapping machines extended, or so located that an operator in one location can control both machines?
Are such levers provided and so arranged or guarded as to prevent accidental starting?
Is the electric control station for starting and stopping the electric motor driving the wrapping machine and conveyor located near the clutch starting lever?

Wrappers. (j)(2)

Are electrical heaters on wrappers protected by a cover plate properly separated or insulated from the heaters in order that accidental contact with this cover plate will not cause a burn to the operator? (j)(2)(iii)

(k) Biscuit and Cracker Equipment.

Meal, Peanut, and Fig Grinders. (k)(1)

If the hopper is removable, is it provided with an electric interlock so that the machine cannot be put in operation when the hopper is removed? (k)(1)(i)

1910.263 – BAKERY EQUIPMENT
(k) Biscuit and Cracker Equipment.

	YES	NO
Where grid guards cannot be used, are feed conveyors to hoppers, or baffle-type hoppers, provided? (k)(1)(ii)		
In such cases, are hoppers enclosed and provided with hinged covers, and equipped with electric interlocks to prevent operation of the machine with the cover open? (k)(1)(ii)		
Sugar and Spice Pulverizers. (k)(2)		
Are all drive belts used in connection with sugar and spice pulverizers grounded by means of metal combs or other effective means of removing static electricity? (k)(2)(i)		
Is all pulverizing of sugar or spice grinding done in accordance with NFPA 62-1967 and NFPA 656-1959? (k)(2)(i)		
Are magnetic separators provided to reduce fire and explosion hazards? (k)(2)(ii)		
Cheese, Fruit, and Food Cutters. (k)(3)		
Are these machines protected in accordance with the requirements of (k)(1) above? (k)(3)		
Reversible Dough Brakes. (k)(5)		
Are reversible brakes provided with a guard or tripping mechanism on each side of the rolls? (k)(5)		
Are these guards so arranged as to stop the machine or reverse the direction of the rolls so that they are outrunning if the guard is moved by contact of the operator? (k)(5)		
Cross-Roll Brakes. (k)(6)		
Are cross-roll brakes provided with guards that are similar in number and equal in effectiveness to guards on hand-fed brakes? (k)(6)		
Box- and Roll-Type Dough Sheeters. (k)(7)		
Are sheeting rolls guarded at the point where the dough enters the rolls, so that the operator's fingers cannot get into the nip point? (k)(7)(i)		
Do hoppers for sheeters have an automatic stop bar or automatic stopping device along the back edge of the hopper? (k)(7)(ii)		
If construction does not permit location at the back edge, is the automatic stop bar or automatic stopping device located where it will be most effective to accomplish the desired protection? (k)(7)(ii)		
Rotary, Die Machines, Pretzel Rolling, and Pretzel-Stick Extruding Machines. (k)(9)		
Do dough hoppers have the entire opening protected with substantial grid-type guards to prevent the employee from getting his hands caught in moving parts, or as an alternative, is the hopper extended high enough so that the operator's hands cannot get into moving parts? (k)(9)		
Pan Cooling Towers. (k)(12)		
Where pan cooling towers extend to two or more floors, is a lockout switch provided on each floor in order that mechanics working on the tower may positively lock the mechanism against starting? (k)(12)(i)		
Is only one start switch used in the motor control circuit? (k)(12)(i)		

1910.263 – BAKERY EQUIPMENT
(k) Biscuit and Cracker Equipment.

	YES	NO
Chocolate Melting, Refining, and Mixing Kettles. (k)(13)		
Is each kettle provided with a cover to enclose the top of the kettle? (k)(13)		
Is the bottom outlet of each kettle of such size and shape that the operator cannot reach in to touch the revolving paddle, or come in contact with the shear point between the paddle and the side of the kettle? (k)(13)		
Peanut Cooling Trucks. (k)(17)		
Is there a grid-type cover over the entire top of mechanically operated peanut cooling trucks? (k)(17)		
(l) Ovens.		
General Location. (l)(1)		
Are ovens so located that possible fire or explosion will not expose groups of persons to possible injury? (l)(1)(vii)		
Are ovens located so that they will not adjoin lockers, lunch or sales rooms, main passageways, or exits? (l)(1)(vii)		
Safeguards of Mechanical Parts. (l)(3)		
Are emergency stop buttons provided on mechanical ovens near the point where operators are stationed? (l)(3)(i)		
Is piping at ovens tested to be gastight? (l)(3)(ii)		
Are main shutoff valves, that are operable separately from any automatic valve, provided to permit turning off the fuel or steam in case of emergency?		
(a) Are main shutoff valves located so that explosions, fires, etc. will not prevent access to these valves? *(b)* Are main shutoff valves required to be locked in the closed position when men must enter the oven or when the oven is not in service? (l)(3)(iii)		
Electrical Heating Equipment. (l)(8)		
Is a main disconnect switch or circuit breaker provided? (l)(8)(iii)		
Is this switch or circuit breaker so located that it can be reached quickly and safely? (l)(8)(iii)		
Does the main switch or circuit breaker have provisions for locking it in the open position, if any work on the electrical equipment or inside the oven must be performed? (l)(8)(iii)		
General Requirements. (l)(9)		
Are protecting devices properly maintained and kept in working order? (l)(9)(i)		
Are all safety devices on ovens inspected at intervals of not less than twice a month by an especially appointed, properly instructed bakery employee, and not less than once a year by representatives of the oven manufacturers? (l)(9)(ii)		
(a) Is protection of gas pilot lights provided when it is impracticable to protect the main flame of the burner, and where the pilot flame cannot contact the flame electrode without being in the path of the main flame of the burner? Does failure of any gas pilot automatically shut off the fuel supply to the burner? *(b)* Are ovens with multiple burners equipped with individual atmospheric pilot lights where there is sufficient secondary air in the baking chamber, and where gas is available, or is each burner equipped with an electric spark-type ignition device? (l)(9)(iii)		

1910.263 – BAKERY EQUIPMENT
(l) Ovens.

YES NO

Are burners of a capacity exceeding 150,000 Btu per hour and equipped with electric ignition protected in addition by quick-acting combustion safeguards?

(a) Does the high-tension current for any electric spark-type ignition device originate in a power supply line which is interlocked with the fuel supply for the oven in such a way that, in case of current failure both the source of electricity to the high-tension circuits and the fuel supply will be turned off simultaneously?
(c) Are combustion safeguards used in connection with electric ignition systems on ovens so designed as to prevent an explosive mixture from accumulating inside the oven before ignition has taken place? (l)(9)(iv)

When fuel is supplied and used at line pressure, are safety shutoff valves provided in the fuel line leading to the burner?

(a) When fuel is supplied in excess of line pressure, are safety shutoff valves provided in the fuel line leading to the burners, unless the fuel supply lines are equipped with other automatic valves which will prevent the flow of fuel when the compressing equipment is stopped?
(b) Is the safety shutoff valve positively tight and is it tested at least twice monthly?
(e) Does a safety shutoff valve require manual operation for reopening after it has closed, or is the electric circuit so arranged that it will require a manual operation for reopening the safety shutoff valve?
(f) Are manual reset-type safety shutoff valves so arranged that they cannot be locked in an open position by internal means?
(g) Where blowers are used for supplying the air for combustion, is the safety shutoff valve interlocked so that it will close in case of air failure?
(h) Where gas or electric ignition is used, does the safety shutoff valve close in case of ignition failure?
On burners equipped with combustion safeguards, does the valve close in case of burner flame failure? (l)(9)(v)

Is one main, manually operated, fuel shutoff valve provided on each oven, and is it located ahead of all other valves in the system? (l)(9)(vi)

Are all individual gas or oil burners with a heating capacity over 150,000 Btu per hour protected by a safeguard which is actuated by the flame, and which will react to the flame failure in a time interval not to exceed 2 seconds? (l)(9)(vii)

Do all safeguards, once having shut down a gas or oil burner, require manual resetting and starting of the burner or burners? (l)(9)(vii)

Are all spaces in an oven (except direct fired ovens) which could be filled with an explosive mixture, protected by explosion vents? (l)(9)(viii)

Are explosion vents made of minimum weight consistent with adequate insulation?

(a) Are explosion doors which have a substantial weight attached by chains or similar means to prevent flying parts from injuring the personnel in case of an explosion?

1910.263 – BAKERY EQUIPMENT
(l) Ovens.

YES NO

(b) Where explosion vents are so located that flying parts or gases might endanger the personnel working on or near the oven, are internal or external protecting means provided in the form of heavily constructed shields or deflectors made from noncombustible material?
(c) The above items (viii) (a) and (b) **do not** apply on heating systems on ovens in which the fuel is admitted only to enclosed spaces which have been tested to prove that their construction will resist repeated explosions without deformation. (l)(9)(viii)

Where the gas supply pressure is substantially higher than that at which the burners of an oven are designed to operate, is a gas pressure regulator employed?

(d) Is a relief valve placed on the outlet side of gas pressure regulators, where gas is supplied at high pressure?
Is the discharge from this valve piped to the outside of the building? (l)(9)(xi)

Direct-Fired Ovens. (l)(10)

Are direct-fired ovens safeguarded against failure of fuel, air, or ignition? (l)(10)(i)

To prevent the possible accumulation of explosive gases from being ignited after a shutdown, are all direct-fired ovens with a heating capacity over 150,000 Btu per hour ventilated before the ignition system, combustion air blower, and the fuel can be turned on? (l)(10)(ii)

Does such preventilation insure at least four complete changes of atmosphere in the baking chamber by discharging the oven atmosphere to the outside of the building and entraining fresh air into it? (l)(10)(ii)

Is such preventilation repeated whenever the heating equipment is shut down by a safety device? (l)(10)(ii)

Direct Recirculating Ovens. (l)(11)

Is each circulating fan in direct recirculating ovens interconnected with the burner in such a manner that the fuel is shut off by a safety valve when the fan is not running? (l)(11)(i)

Is the flame of the burner or burners in direct recirculating ovens protected by a quick-acting flame-sensititve safeguard which will automatically shut off the fuel supply in case of burner failure? (l)(11)(ii)

Indirect Recirculating Ovens. (l)(15)

Are duct systems (in ovens) operating under pressure tested for tightness in the initial starting of the oven, and also at intervals not farther apart than 6 months? (l)(15)(iii)

1910.264 – LAUNDRY MACHINERY AND OPERATIONS

YES NO

(a) Definitions Applicable to this Section.

Laundry. (a)(1)

The term "laundry" shall mean an establishment wherein the washing, ironing, or other finishing of clothes, or any other textiles is done, but excluding printing, bleaching, dry cleaning, or dyeing of clothes or other textiles. (a)(1)

(b) General Requirements.

This section applies to moving parts of equipment used in laundries and to conditions peculiar to this industry, with special reference to the point of operation of laundry machines. (b)

(c) Point-Of-Operation Guards.

Washroom Machines. (c)(1)

Washing Machine. (c)(1)(ii)

(b) Is each washing machine provided with means for holding open the doors or covers of inner and outer cylinders or shells while being loaded or unloaded? (c)(1)(ii)

Drying Tumbler. (c)(2)(iii)

(b) Is each drying tumbler provided with means for holding open the doors or covers of inner and outer cylinders or shells while being loaded or unloaded? (c)(2)(iii)

Shaker (clothes tumbler) (c)(2)(iv)

(2) Is each shaker or clothes tumbler of the double-cylinder type provided with means for holding open the doors or covers of inner and outer cylinders or shells while being loaded or unloaded? (c)(2)(iv)(b)

Exception: The provisions of subdivisions (iii) and (iv)(b) of the above items **do not** apply to shakeout or conditioning tumblers where the clothes are loaded into the open end of the revolving cylinder and are automatically discharged out of the opposite end. (c)(2)(v)

Miscellaneous Machines and Equipment. (c)(4)

Steam Pipes. (c)(4)(iii)

(a) Are all steam pipes that are within 7 feet of the floor or working platform, and with which the worker may come into contact, insulated or covered with a heat-resistive material, or otherwise properly guarded?

(b) Where pressure-reducing valves are used, is one or more relief or safety valves provided on the low-pressure side of the reducing valve?

Is the relief or safety valve located adjacent to, or as close as possible to, the reducing valve?

Is proper protection provided to prevent injury or damage caused by fluid escaping from relief or safety valves if vented to the atmosphere?

Are the vents of ample size and as short and direct as possible?

Is the combined discharge capacity of the relief valves such that the pressure rating of the lower-pressure piping and equipment will not be exceeded if the reducing valve sticks or fails to open? (c)(4)(iii)

1910.264 – LAUNDRY MACHINERY AND OPERATIONS

YES NO

(d) Operating Rules.

General. (See 1910.22) (d)(1)

Markers. (d)(1)(iii)

Are markers and others handling soiled clothes warned against touching the eyes, mouth, or any part of the body on which the skin has been broken by a scratch or abrasion, and are they cautioned not to touch or eat food until their hands have been thoroughly washed? (d)(1)(iii)

Instruction of Employees. (d)(1)(v)

Are employees properly instructed as to the hazards of their work, and are they instructed in safe practices, by bulletins, printed rules, and verbal instructions? (d)(1)(v)

Mechanical. (d)(2)

Safety Guards. (d)(2)(i)

(a) Are precautions taken to insure that no safeguard, safety appliance, or device attached to, or forming an integral part of any machinery will be removed or made ineffective except for the purpose of making immediate repairs or adjustments?

Is any such safeguard, safety appliance, or device that is removed or made ineffective during the repair or adjustment of such machinery, replaced immediately upon the completion of such repairs or adjustments?

(e) Moving Parts.

Machine Guarding. (e)(1)

Are moving parts of machines, such as gears, sprockets, belts, pulleys, and shafts guarded in accordance with the items under 1910.219 of this checklist? (e)(1)

1910.265 – SAWMILLS

(a) General Requirements.

Application. (a)(1)

This section includes safety requirements for sawmill operations including, but not limited to, log and lumber handling, sawing, trimming, and planing; waste disposal; operation of dry kilns; finishing; shipping; storage; yard and yard equipment; and for power tools and affiliated equipment used in connection with such operations, but excluding the manufacture of plywood, cooperage, and veneer. (a)(1)

Incorporation of Standards by Reference. (a)(2)

Certain of the paragraphs of this section incorporate and apply occupational safety and health standards of general application without regard to any specific industry. Such standards shall apply to sawmill operations in accordance with the rules of construction set forth in paragraph 1910.5. (a)(2)

(c) Building Facilities, and Isolated Equipment.

Safety Factor. (c)(1)

Are all buildings, docks, tramways, walkways, log dumps, and other structures designed, constructed and maintained so as to support the imposed load in accordance with a safety factor? (c)(1)

1910.265 – SAWMILLS
(c) Building Facilities, and Isolated Equipment.

	YES	NO
Work Areas. (c)(2)		
Are work areas under mills as evenly surfaced as local conditions permit? (c)(2)		
Are they free from unnecessary obstructions, and are they provided with lighting facilities in accordance with ANSI A11.1-1965? (c)(2)		
Floors. (c)(3)		
Is flooring in buildings and on ramps and walkways constructed and installed in accordance with established principles of mechanics and sound engineering practices? (c)(3)		
Are they of adequate strength to support the estimated or actual dead and live loads acting on them with the resultant stress not exceeding the allowable stress for the material being used? (c)(3)		
Floor and Wall Openings. (c)(3)(i)		
Are all floor and wall openings protected as prescribed in 1910.23 of this checklist? (c)(3)(i)		
Areas Beneath Floor Openings. (c)(3)(ii)		
Are areas under floor openings, where practical, fenced off? (c)(3)(ii)		
When it is not practical to fence the areas off, are they plainly marked and are telltales installed to hang over these areas? (c)(3)(ii)		
Floor Maintenance. (c)(3)(iii)		
Is the flooring of buildings, docks, and passageways kept in good repair? (c)(3)(iii)		
When a hazardous condition develops that cannot be immediately repaired, is the area guarded until adequate repairs are made? (c)(3)(iii)		
Nonslip Floors. (c)(3)(iv)		
Are floors, footwalks, and passageways in the work area around machines, or other places where a person is required to stand or walk provided with effective means to minimize slipping? (c)(3)(iv)		
Walkways, Docks, and Platforms. (c)(4)		
Width. (c)(4)(i)		
Are walkways, docks, and platforms of sufficient width to provide adequate passage and working areas? (c)(4)(i)		
Maintenance. (c)(4)(ii)		
Are walkways evenly floored and kept in good repair? (c)(4)(ii)		
Docks. (c)(4)(iii)		
Are docks and runways used for the operation of lift trucks and other vehicles equipped with a substantial guard or shear timber, except where loading and unloading are being performed? (c)(4)(iii)		
Elevated Walks. (c)(4)(iv)		
Are all elevated walks, runways, or platforms, if 4 feet or more from the floor level, provided with a standard railing except on loading or unloading sides of platforms? (c)(4)(iv)		
If the height exceeds 6 feet, is a standard toeboard also provided to prevent material from rolling or falling off? (c)(4)(iv)		

1910.265 – SAWMILLS
(c) Building Facilities, and Isolated Equipment.

	YES	NO
Elevated Platforms. (c)(4)(v)		
Where elevated platforms are used routinely on a daily basis, are they equipped with stairways or fixed ladders in accordance with 1910.27 of this checklist? (c)(4)(v)		
Hazardous Locations. (c)(4)(vi)		
Where required, are walkways and stairways with standard handrails provided in elevated and hazardous locations? (c)(4)(vi)		
Where such passageways are over walkways or work areas, are standard toeboards provided? (c)(4)(vi)		
Stairways. (c)(5)		
Construction. (c)(5)(i)		
Are stairways constructed in accordance with 1910.24 of this checklist? (c)(5)(i)		
Handrails. (c)(5)(ii)		
Are stairways provided with a standard handrail on at least one side or on any open side? (c)(5)(ii)		
Where stairs are more than 4 feet wide, is there a standard handrail at each side, and where more than 8 feet wide, is a third standard handrail erected in the center of the stairway? (c)(5)(ii)		
Lighting. (c)(5)(iii)		
Are all stairways adequately lighted as prescribed in (9) below? (c)(5)(iii)		
Emergency Exits Including Doors and Fire Escapes. (c)(6)		
Opening. (c)(6)(i)		
Are precautions taken to insure that doors will not open directly on or block a flight of stairs, and will swing in the direction of exit travel? (c)(6)(i)		
Identification. (c)(6)(ii)		
Are exits located and identified in a manner that will afford ready exit from all work areas? (c)(6)(ii)		
Swinging Doors. (c)(6)(iii)		
Are all swinging doors provided with windows; with one window for each section of double swinging doors? (c)(6)(iii)		
Are such windows of shatterproof or safety glass? (c)(6)(iii)		
Sliding Doors. (c)(6)(iv)		
Where sliding doors are used as exits, is an inner door cut inside each of the main doors and arranged to open outward? (c)(6)(iv)		
Barriers and Warning Signs. (c)(6)(v)		
Where a doorway opens upon a railroad track or upon a tramway or dock over which vehicles travel, is a barrier or other warning device placed to prevent workmen from stepping into moving traffic? (c)(6)(v)		
Vats and Tanks. (c)(8)		
Are all open vats and tanks into which workmen could fall properly guarded? (c)(8)		
Lighting. (c)(9)		
Adequacy. (c)(9)(i)		
Is illumination provided and is it designed to supply adequate general and local lighting to rooms, buildings and work areas during the time of use? (c)(9)(i)		

YES NO

Effectiveness. (c)(9)(ii)

Do the factors upon which the adequacy and effectiveness of illumination is judged, include the following:

(a) The quantity of light in foot-candle intensity shall be sufficient for the work being done;
(b) The quality of the light shall be such that it is free from glare, and has correct direction, diffusion, and distribution;
(c) Shadows and extreme contrasts shall be avoided or kept to a minimum. (c)(9)(ii)

Ladders. (c)(10)

Are ladders installed and maintained as specified in 1910.25, 1910.26, and 1910.27 of this checklist? (c)(10)

Hazard Marking. (c)(11)

Are physical hazards marked as specified in 1910.144 of this checklist? (c)(11)

Electrical Wiring and Equipment. (c)(12)

Is all electrical equipment installed and maintained in accordance with the requirements of the National Electrical Code? (c)(12)(i)

Repairs. (c)(12)(ii)

Are electrical repairs made only by authorized and qualified personnel? (c)(12)(ii)

Identification. (c)(12)(iii)

Are marks of identification on electrical equipment clearly visible? (c)(12)(iii)

Protective Equipment. (c)(12)(iv)

Is rubber protective equipment provided as required by 1910.137 of this checklist? (c)(12)(iv)

Open Switches. (c)(12)(v)

Before working on electrical equipment, are switches open and tagged, blocked, or locked out? (c)(12)(v)

Concealed Conductors. (c)(12)(vi)

Where electrical conductors are known to be concealed, is work prohibited from being performed until such conductors are located? (c)(12)(vi)

Passageways To Panels. (c)(12)(vii)

Are passageways to switch centers or panels kept free from obstruction at all times? (c)(12)(vii)

Is not less than 3 feet of clear space maintained in front of switch centers or panels at all times? (c)(12)(vii)

Bridging Fuses. (c)(12)(ix)

Are doubling or bridging fuses prohibited? (c)(12)(ix)

Hydraulic Systems. (c)(13)

Are means provided to block, chain, or otherwise secure equipment normally supported by hydraulic pressure so as to provide for safe maintenance? (c)(13)

Liquefied Petroleum Gas Storage and Handling. (c)(14)

Is storage and handling of liquefied petroleum gas in accordance with the requirements of 1910.110 of this checklist? (c)(14)

Gas Piping and Appliances. (c)(15)

Is all gas piping and are all appliances installed in accordance with ANSI Z21.30-1964? (c)(15)

YES NO

Flammable Liquids. (c)(16)

Are flammable liquids stored and handled in accordance with 1910.106 of this checklist? (c)(16)

Storage, Handling, and Use of Chemicals. (c)(17)
Threshold Limits. (c)(17)(i)

Are precautions taken to insure that employees are not exposed to airborne concentrations of toxic dusts, fumes, vapors, mists, or gases that exceed the threshold limit values set forth by 1910.1000 in this checklist? (c)(17)(i)

Protective Equipment. (c)(17)(ii)

Is the use of chemicals controlled so as to protect employees from harmful exposure to toxic materials? (c)(17)(ii)

Where necessary, are employees provided with and are they required to wear such protective equipment as will afford adequate protection against harmful exposure as required by subpart I of this checklist? (c)(17)(ii)

Open Surface Tank Operations. (c)(17)(iii)

Do open surface tank operations conform to the requirements of 1910.94(d) of this checklist? (c)(17)(iii)

Conveyors. (c)(18)
Standards. (c)(18)(i)

Is the construction, operation, and maintenance of conveyors in accordance with ANSI B20.1-1957? (c)(18)(i)

Guarding. (c)(18)(ii)

Are spiked live rolls adequately guarded? (c)(18)(ii)

Stationary Tramways and Trestles. (c)(19)
Foundations and Walkways. (c)(19)(i)

Do tramways and trestles have substantial mud sills or foundations and are they frequently inspected and kept in repair? (c)(19)(i)

When vehicles are operated on tramways and trestles which are used for foot passage, is traffic controlled or a walkway with standard handrails at the outer edge and shear timber on the inner edge provided? (c)(19)(i)

Is this walkway wide enough to allow adequate clearance to vehicles? (c)(19)(i)

When walkways cross over other thoroughfares, are they solidly fenced at the outer edge to a height of 42 inches over such thoroughfares? (c)(19)(i)

Clearance. (c)(19)(ii)

Do stationary tramways and trestles have a vertical clearance of 22 feet over railroad rails? (c)(19)(ii)

When constructed over carrier docks or roads, do they have a clearance of 6 feet above the driver's footrest on the carrier, and in any event, is this clearance at least 12 feet from the roadway? (c)(19)(ii)

In existing operations where it is impractical to obtain such clearance, are telltales, electric signals, signs or other precautionary measures installed? (c)(19)(ii)

Blower, Collecting, and Exhaust Systems. (c)(20)
Design, Construction, and Maintenance. (c)(20)(i)

Are blower collecting, and exhaust systems designed, constructed and maintained in accordance with ANSI Z33.1-1961 and Z12.2-1962? (c)(20)(i)

1910.265 – SAWMILLS
(c) Building Facilities, and Isolated Equipment.

YES NO

Collecting Systems. (c)(20)(ii)

Are all mills containing one or more machines that create dust, shavings, chips, or slivers during a period of time equal to or greater than one-fourth of the working day, equipped with a collecting system? (c)(20)(ii)

Does such system have sufficient strength and capacity to enable it to remove such refuse from points of operation and immediate vicinities of machines and work areas? (c)(20)(ii)

Exhaust or Conveyor Systems. (c)(20)(iii)

Is each woodworking machine that creates dust, shavings, chips, or slivers equipped with an exhaust or conveyor system located and adjusted to remove the maximum amount of refuse from the point of operation and immediate vicinity? (c)(20)(iii)

Dust Chambers. (c)(20)(v)

Are exhaust pipes prohibited from being discharged into an unconfined outside pile if uncontrolled fire or explosion hazards are created? (c)(20)(v)

If they empty into settling or dust chambers, are they designed to prevent the dust or refuse from entering any work area? (c)(20)(v)

Are such chambers constructed and operated to minimize the danger of fire or dust explosion? (c)(20)(v)

Hand Removal of Refuse. (c)(20)(vi)

Are provisions made for the daily removal of refuse in all operations not required to have an exhaust system, or having refuse too heavy, bulky, or otherwise unsuitable to be handled by the exhaust system? (c)(20)(vi)

Chippers. (c)(21)

Whole-Log Chippers. (c)(21)(i)

Is the feed system to the chipper so arranged that the operator does not stand in direct line with the chipper spout? (c)(21)(i)

Is the chipper spout enclosed to a height of not less than 36 inches from the floor or the operator's platform? (c)(21)(i)

Is a safety belt and lifeline worn by workmen when working at or near the spout, unless the spout is guarded? (c)(21)(i)

Is the lifeline short enough to prevent workers from falling into the chipper? (c)(21)(i)

Hogs. (c)(21)(ii)

(a) Are hog mills so designed and arranged that from no position on the rim of the chute will the distance to the cutter knives be less than 40 inches?
(b) Are hog feed chutes provided with suitable and approved baffles, which minimize material from being thrown from the mill?
(c) Are employees feeding hog mills provided with safety belts and lines unless guarded? (c)(21)(ii)

1910.265 – SAWMILLS
(c) Building Facilities, and Isolated Equipment.

YES NO

Mechanical Power-Transmission Apparatus. (c)(22)

Is the construction, operation, and maintenance of all mechanical power-transmission apparatus in accordance with the requirements of 1910.219 of this checklist? (c)(22)

Bins, Bunkers, Hoppers, and Fuel Houses. (c)(23)

Guarding. (c)(23)(i)

Are open bins, bunkers, and hoppers whose upper edges extend less than 3 feet above the working level equipped with standard handrails and toeboards, or do they have their tops covered by a substantial grill or grating with openings small enough to prevent a man from falling through? (c)(23)(i)

Use of Wheeled Equipment To Load Bins. (c)(23)(ii)

Where automative or other wheeled equipment is used to move materials into bins, bunkers, and hoppers, are adequate guardrails installed along each side of the runway, and a substantial bumper stop provided when necessary? (c)(23)(ii)

Exits, Lighting, and Safety Devices. (c)(23)(iii)

Do fuel houses and bins have adequate exits and lighting, and all necessary safety devices provided, and are they used by persons entering these structures? (c)(23)(iii)

Walkways. (c)(23)(iv)

Where needed, do fuel houses and bins have a standard railed platform or walkway near the top? (c)(23)(iv)

Ropes, Cables, Slings, and Chains. (c)(24)

Safe Usage. (c)(24)(i)

Are ropes, cables, slings, and chains used in accordance with safe use practices recommended by the manufacturer, or within the safe limits recommended by the equipment manufacturer when used in conjunction with it? (c)(24)(i)

Hooks. (c)(24)(ii)

Is the use of open hooks prohibited in rigging to lift any load where there is a hazard from relieving the tension on the hook, from the load or hook catching or fouling? (c)(24)(ii)

Work By Qualified Persons. (c)(24)(iii)

Is installation, inspection, maintenance, repair, and testing of ropes, cables, slings and chains done only by persons qualified to do such work? (c)(24)(iii)

Slings. (c)(24)(iv)

(a) Are slings and their fittings and fastenings, when in use, inspected daily for evidence of overloading, excessive wear, or damage?
Are slings found to be defective removed from service?
(b) Is proper storage provided for slings while not in use?
(c) Is suitable protection provided between the sling and sharp unyielding surfaces of the load to be lifted? (c)(24)(iv)

Ropes or Cables. (c)(24)(v)

(a) Are wire ropes or cables inspected when installed, and once each week thereafter, when in use?
Are they removed from hoisting or load-carrying service when kinked or when one of the following conditions exists:

YES NO

(1) When three broken wires are found in one lay of 6 by 6 wire rope;

(2) When six broken wires are found in one lay of 6 by 19 wire rope;

(3) When nine broken wires are found in one lay of 6 by 37 wire rope;

(4) When eight broken wires are found in one lay of 8 by 19 wire rope;

(5) When marked corrosion appears;

(6) Is wire rope of a type not described herein removed from service when 4 percent of the total number of wires composing such rope are found to be broken in one lay?

(b) Is wire rope removed from service due to defects plainly marked or identified as being unfit for further use on cranes, hoists, and other load-carrying devices?

(c) Is the ratio between the rope diameter and the drum, block, sheave, or pulley tread diameter such that the rope will adjust itself to the bend without excessive wear, deformation, or injury?

Are precautions taken to insure that the safe value of drums, blocks, sheaves, or pulleys will not be reduced when replacing such items, unless compensating changes are made for rope used and for safe loading limits? (c)(24)(v)

Drums, Sheaves, and Pulleys. (c)(24)(vi)

Are drums, sheaves, and pulleys smooth and free from surface defects liable to injure rope? (c)(24)(vi)

Are drums, sheaves, or pulleys having eccentric bores or cracked hubs, spokes, or flanges removed from service? (c)(24)(vi)

Connections. (c)(24)(vii)

Are connections, fittings, fastenings, and other parts used in connections with ropes and cables of good quality and of proper size and strength, and are they installed in accordance with the manufacturer's recommendations? (c)(24)(vii)

Socketing, Splicing, and Seizing. (c)(24)(viii)

(a) Is socketing, splicing, and seizing of cables performed only by qualified persons?

(b) Are all eye splices made in an approved manner and are wire rope thimbles of proper size fitted in the eye, except that in slings, the use of thimbles shall be optional?

(c) Do wire rope clips attached with U-bolts have these bolts on the dead or short end of the rope?

Are the U-bolt nuts tightened immediately after initial load carrying use and at frequent intervals thereafter?

(d) When a wedge socket-type fastening is used, is the dead or short end of the cable clipped with a U-bolt or otherwise made secure against loosening?

(e) Fittings. Are hooks, shackles, rings, padeyes, and other fittings that show excessive wear or that have been bent, twisted, or otherwise damaged removed from service?

(f) Running Lines. Are running lines of hoisting equipment located within 6 feet 6 inches of the ground or working level boxed off or otherwise guarded, or is the operating area restricted?

(g) Number of Wraps on Drum. Is there at least two full wraps of hoisting cable on the drum of cranes and hoists at all times of operation?

(h) Drum Flanges. Do drums have a flange at each end to prevent the cable from slipping off?

YES NO

(i) Sheave Guards. Are bottom sheaves protected by close fitting guards to prevent cables from jumping the sheave?

(j) Preventing Abrasion. Is the reeving of a rope so arranged as to minimize chafing or abrading while in use? (c)(24)(viii)

Chains. (c)(24)(ix)

(a) Are chains used in load carrying service inspected before initial use and weekly thereafter?

(b) Is chain normalized or annealed periodically as recommended by the manufacturer?

(c) Are chains that in any 3-foot length are found to have stretched one-third the length of a link discarded?

(d) Is the use of bolts or nails for shortening prohibited?

(e) Are bolts prohibited from fastening chains together? (c)(24)(ix)

Fiber Rope. (c)(24)(x)

(a) Is frozen fiber rope prohibited from being used in load carrying service?

(b) Is fiber rope that has been subjected to acid or excessive heat prohibited from being used for load carrying purposes?

(c) Is fiber rope protected from abrasion by padding where it is fastened or drawn over square corners or sharp or rough surfaces? (c)(24)(x)

Mechanical Stackers and Unstackers. (c)(26)

Power-Transmission Apparatus. (c)(26)(i)

Do stackers and unstackers have all gears, sprockets, chains, belt drives, and other power transmission apparatus guarded as specified in 1910.219? (c)(26)(i)

Lumber Lifting Devices. (c)(26)(ii)

Are lumber lifting devices on all stackers designed and arranged so as to minimize the possibility of lumber falling from such devices? (c)(26)(ii)

Blocking Hoisting Platform. (c)(26)(iii)

Are means provided to positively block the hoisting platform when employees must go beneath the stacker and unstacker hoist? (c)(26)(iii)

Identifying Controls. (c)(26)(iv)

Is every manually operated control switch properly identified and located so as to be readily accessible to the operator? (c)(26)(iv)

Locking Main Control Switches. (c)(26)(v)

Are main control switches so designed that they can be locked in the open position? (c)(26)(v)

Guarding Side Openings. (c)(26)(vi)

Are the hoistway side openings at the top level of the stacker and unstacker protected by enclosures of standard railings? (c)(26)(vi)

Guarding Hoistway Openings. (c)(26)(vii)

Are the hoistway openings guarded when the hoist platform or top of the load is below the working platform? (c)(26)(vii)

Guarding Lower Landing Area. (c)(26)(viii)

Is the lower landing area of stackers and unstackers guarded by enclosures that prevent entrance to the area or pit below the hoist platform? (c)(26)(viii)

1910.265 – SAWMILLS
(c) Building Facilities, and Isolated Equipment.

YES NO

Are entrances protected by electrically interlocked gates which, when open, will disconnect the power and set the hoist brakes? (c)(26)(viii)

If the interlock is not installed, are other positive means provided to protect the entrance? (c)(26)(viii)

Inspection. (c)(26)(ix)

Is every stacker and unstacker inspected at frequent intervals, and are all defective parts immediately repaired or replaced? (c)(26)(ix)

Cleaning Pits. (c)(26)(x)

Are safe means of entrance and exit provided to permit cleaning of pits? (c)(26)(x)

Preventing Entry To Hazardous Area. (c)(26)(xi)

Where the return of trucks from unstacker to stacker is by mechanical power or gravity, are adequate signs, warning devices, or barriers erected to prevent entry into the hazardous area? (c)(26)(xi)

Lumber Piling and Storage. (c)(27)

Pile Foundations. (c)(27)(i)

In stacking units of lumber are pile foundations designed and arranged to support maximum loads without sinking, sagging, or permitting the piles to topple? (c)(27)(i)

In unit package piles, are substantial bolsters or unit separators placed between each package directly over the stickers? (c)(27)(i)

Stacking Dissimilar Unit Packages. (c)(27)(ii)

Are long units of lumber prohibited from being stacked upon shorter packages, except where a stable pile can be made with the use of package separators? (c)(27)(ii)

Unstable Piles. (c)(27)(iii)

Are piles of lumber which have become unstable immediately made safe, or is the area into which they might fall fenced or barricaded and are employees prohibited from entering it? (c)(27)(iii)

Stickers. (c)(27)(iv)

Are unit packages of lumber provided with stickers as necessary to insure stability under ordinary operating conditions? (c)(27)(iv)

Sticker Alignment. (c)(27)(v)

Do stickers extend the full width of the package and are they uniformly spaced, and are they aligned one above the other? (c)(27)(v)

Are stickers prohibited from protruding more than 2 inches beyond the sides of the package? (c)(27)(v)

Pile Height. (c)(27)(vi)

Is the height of unit package piles dependent on the dimensions of the packages and stability under normal operating conditions? (c)(27)(vi)

Lumber Loading. (c)(28)

Are loads built and secured to insure stability in transit? (c)(28)

Burners. (c)(29)

1910.265 – SAWMILLS
(c) Building Facilities, and Isolated Equipment.

YES NO

Guying. (c)(29)(i)

If the burner stack is not self-supporting, is it guyed or otherwise supported? (c)(29)(i)

Runway. (c)(29)(ii)

Is the conveyor runway to the burner equipped with a standard handrail? (c)(29)(ii)

If the runway crosses a roadway or thoroughfare, are standard toeboards provided? (c)(29)(ii)

Vehicles. (c)(30)

Scope. (c)(30)(i)

The following items include all mobile equipment normally used in sawmill, planing mill, storage, shipping, and yard operations. (c)(30)(i)

Warning Signals and Spark Arrestors. (c)(30)(ii)

Are all vehicles equipped with audible warning signals and where practicable, do they have spark arrestors? (c)(30)(ii)

Lights. (c)(30)(iii)

Are all vehicles operated in the dark or in poorly lighted areas equipped with head and taillights? (c)(30)(iii)

Overhead Guard. (c)(30)(iv)

Are all vehicles operated in areas where overhead hazards exist equipped with an approved overhead guard?(c)(30)(iv)

Platform Guard. (c)(30)(v)

Where the operator is exposed to hazard from backing the vehicle into objects, is an approved platform guard provided and so arranged as to not impede the exit of the driver from the vehicle? (c)(30)(v)

Exposed Parts. (c)(30)(vi)

Are vehicle flywheels, gears, sprockets, chains, shear points, and other exposed parts constituting a hazard to the operator or other persons guarded in accordance with the requirements of 1910.219 of this checklist? (c)(30)(vi)

Operation In Buildings. (c)(30)(vii)

Are vehicles powered by internal combustion engines prohibited from operating in buildings unless the buildings are adequately ventilated? (c)(30)(vii)

Load Limits. (c)(30)(viii)

Are vehicles prohibited from operating with loads exceeding the safe load capacity? (c)(30)(viii)

Brakes. (c)(30)(ix)

Are all vehicles equipped with brakes capable of holding and controlling the vehicle and capacity load upon any incline or grade over which they may be operated? (c)(30)(ix)

Lift Trucks. (c)(30)(x)

Are lift trucks designed, constructed, maintained, and operated in accordance with the requirements of 1910.178 of this checklist? (c)(30)(x)

Carriers. (c)(30)(xi)

(a) Are carriers so designed and constructed that the operator's field of vision will not be unnecessarily restricted?
(b) Are carriers provided with an access ladder or equivalent? (c)(30)(xi)

1910.265 – SAWMILLS

(c) Building Facilities, and Isolated Equipment.

YES NO

Lumber Hauling Trucks. (c)(30)(xii)

(a) On trucks where movement of load on stopping would endanger the operator, is a substantial bulkhead installed behind the operator's seat, and does it extend to the top of the operator's compartment?

(b) Are stakes, stake pockets, racks, tighteners, and binders used to provide adequate means to secure the load against any movement during transit?

(c) Where rollers are used, are at least two equipped with locks which shall be locked when supporting loads during transit? (c)(30)(xii)

Traffic Control and Flow. (c)(31)

Hazardous Crossings. (c)(31)(i)

Are railroad tracks and other hazardous crossings plainly posted and appropriate traffic control devices utilized in accordance with ANSI D8.1-1967? (c)(31)(i)

Restricted Overhead Clearance. (c)(31)(ii)

Are all areas of restricted side or overhead clearance plainly marked? (c)(31)(ii)

Pickup and Unloading Points. (c)(31)(iii)

Are pickup and unloading points and paths for lumber packages on conveyors and transfers, and other areas where accurate spotting is required, plainly marked and wheel stops provided where necessary? (c)(31)(iii)

Aisles, Passageways and Roadways. (c)(31)(iv)

Are aisles, passageways, and roadways sufficiently wide to provide safe side clearance? (c)(31)(iv)

(d) Log Handling, Sorting, and Storage.

Log Unloading Methods, Equipment, and Facilities. (d)(1)

Unloading Methods. (d)(1)(i)

(a) Are stakes and chocks which trip constructed in such a manner that the tripping mechanism is activated at the opposite side of the load being tripped?

(b) Are binders on logs prohibited from being released prior to securing the load with unloading lines or other unloading device?

(c) Are binders released only from the side on which the unloader operates, except when released by remote control devices or except when a person making release is protected by racks or stanchions or other equivalent means?

(d) Do loads on which a binder is fouled by the unloading machine have an extra binder or metal band of equal strength placed around the load, or the load secured so the fouled binder can be safely removed? (d)(1)(i)

Unloading Equipment and Facilities. (d)(1)(ii)

(a) Are machines used for hoisting, unloading, or lowering logs equipped with brakes capable of controlling or holding the maximum load in midair?

(b) Are the lifting cylinders of all hydraulically operated log handling machines equipped with a positive device for preventing the uncontrolled lowering of the load or forks in case of a failure in the hydraulic system?

(c) Is a limit switch installed on powered log handling machines to prevent the lift arms from traveling too far in the event the control switch is not released in time?

(d) When forklift-type machines are used to load trailers, is a means of securing the loading attachment to the fork installed and used?

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(d) Log Handling, Sorting, and Storage.

YES NO

(e) Do A-frames and similar log unloading devices have adequate height to provide safe clearance for swinging loads, and to provide for adequate crotch lines and spreader bar devices?

(f) Are log handling machines that are used to stack logs or lift loads above operator's head equipped with adequate overhead protection?

(g) Are all mobile log handling machines equipped with headlights and backup lights?

(h) Are unloading devices equipped with a horn or other plainly audible signaling device?

(i) Is the movement of unloading equipment coordinated by audible or hand signals when the operator's vision is impaired or operating in the vicinity of other employees?

(j) Are wood pike poles made of straight-grained, select material?

Are metal or other conductive pike poles prohibited from being used around exposed energized electrical conductors?

Are defective, blunt, or dull pike poles prohibited from being used? (d)(1)(ii)

Log Unloading and Storage Areas. (d)(2)

General. (d)(2)(i)

(a) Are log dumps, booms, ponds, or storage areas that are used at night illuminated in accordance with the requirements of ANSI A11.1-1965 (R-1970)?

(b) Are log unloading areas arranged and maintained to provide a safe working area?

(c) Where skids are used, is a space adequate to clear a man's body maintained between the top of the skids and the ground?

(d) Are signs prohibiting unauthorized foot or vehicle traffic in log unloading and storage areas posted? (d)(2)(i)

Water Log Dumps. (d)(2)(ii)

(a) Are ungrounded electrically powered hoists that use handheld remote control in grounded locations, actuated by circuits operating at less than 50 volts to ground?

(b) Are roadbeds, at log dumps, of sufficient width and evenness to insure safe operation of equipment?

(c) Is an adequate brow log or are skid timbers or the equivalent provided where necessary?

(d) Are unloading lines so arranged that it is not necessary for the employees to attach them from the pond or dump side of the load, except when entire loads are lifted from the log-transporting vehicle?

(e) Are unloading lines, crotch lines, or equally effective means arranged and used in a manner to minimize the possibility of any log from swinging or rolling back?

(f) When logs are unloaded with peavys or similar manual methods, are means provided and used that will minimize the danger from rolling or swinging logs?

(g) Are guardrails, walkways, and standard handrails installed?

(h) Are approved life rings with line attached and maintained to retain buoyancy provided? (d)(2)(ii)

Log Booms and Ponds. (d)(2)(iii)

(a) Are walkways and floats installed and securely anchored to provide adequate passageway for employees?

(b) Are all regular boom sticks and foot logs reasonably straight, with no protruding knots and bark, capable of supporting above the water line at either end, the weight of an employee and equipment?

YES NO

(c) Are permanent cable swifters so arranged that it will not be necessary to roll boom sticks in order to attach or detach them?

(d) Is periodic inspection of cable or dogging lines made to determine when repair or removal from service is necessary?

(e) Are the banks of the log pond in the vicinity of the log haul reinforced to prevent caving in?

(f) Are artificial log ponds drained, cleaned and refilled when unhealthy stagnation or pollution occurs?

(g) Are employees whose duties require them to work from boats, floating logs, boom sticks, or walkways along or on water provided with, and are they required to wear appropriate buoyant devices while performing such duties?

(h) Are stiff booms made up of two float logs wide secured by boom chains or other connecting devices, and are they of a width adequate for the working needs?

Are walking surfaces free of loose material and are they maintained in good repair?

(i) Are boom sticks fastened together with adequate crossties or couplings?

(j) Are floating donkeys or other power-driven machinery used on booms placed on a raft or float with enough buoyancy to keep the deck well above water?

(k) Do all sorting gaps have a substantial stiff boom on each side? (d)(2)(iii)

Pond Boats and Rafts. (d)(2)(iv)

Are the applicable provisions of NFPA No. 302-1968, Standard for Fire Protection for Motorcraft?

(a) Are decks of pond boats covered with nonslip material?

(b) Are powered pond boats or rafts provided with at least one approved fire extinguisher, and one lifering with line attached?

(c) Is boat fuel transported and stored in approved safety containers?

(d) Is inspection, maintenance, and ventilation of the bilge area provided to prevent accumulation of highly combustible materials?

(e) Is adequate ventilation provided for the cabin area on enclosed cabin-type boats to prevent accumulation of harmful gases or vapors? (d)(2)(iv)

Dry Deck Storage. (d)(2)(v)

(a) Are dry deck storage areas kept orderly and are they maintained in a condition which is conducive to safe operation of mobile equipment?

(b) Are logs stored in a safe and orderly manner, and are roadways and traffic lines maintained at a width adequate for safe travel of log handling equipment?

(c) Are logs arranged to minimize the chance of accidentally rolling from the deck? (d)(2)(v)

Log Hauls and Slips. (d)(2)(vi)

(a) Do walkways along log hauls have a standard handrail on the outer edge, and cleats or other means to assure adequate footing and enable employees to walk clear of the log chute?

(b) Are log haul bull chains or cable designed, installed, and maintained to provide adequate safety for the work need?

(c) Is log haul gear and bull chain drive mechanism guarded?

(d) Are substantial troughs for the return strand of log haul chains provided over passageways?

YES NO

(e) Are log haul controls located and identified to operate from a position where the operator will, at all times, be in the clear of logs, machinery, lines, and rigging?

In operations where control is by lever exposed to incoming logs, is the lever so arranged to operate the log haul only when moved toward the log slip or toward the log pond?

(f) Is a positive stop installed on all log hauls to prevent logs from traveling too far ahead in the mill?

(g) Is overhead protection provided for employees working below logs being moved to the log deck?

(h) Are log wells provided with safeguards to minimize the possibility of logs rolling back into the well from log deck? (d)(2)(vi)

Log Decks. (d)(3)

Access. (d)(3)(i)

Is a safe access to the head rig provided? (d)(3)(i)

Stops. (d)(3)(ii)

Are log decks provided with adequate stops, chains, or other safeguards to prevent logs from rolling down the deck onto the carriage or its runway? (d)(3)(ii)

Barricade. (d)(3)(iii)

Is a barricade or other positive stop of sufficient strength to stop any log erected between the sawyer's stand and the log deck? (d)(3)(iii)

Loose Chains. (d)(3)(iv)

Are loose chains from overhead canting devices or other equipment prohibited from hanging over the log deck in such a manner as to strike employees? (d)(3)(iv)

Swing Saws. (d)(3)(v)

Are swing saws on log decks equipped with a barricade and stops for protection of employees who may be on the opposite side of the log haul chute? (d)(3)(v)

Drag Saws. (d)(3)(vi)

Where reciprocating log cutoff saws (drag saws) are provided, are they so installed as not to project into walkway or aisle? (d)(3)(vi)

Circular Cutoff Saws. (d)(3)(vii)

Are circular log bucking or cutoff saws so located and guarded as to allow safe entrance to and exit from the building? (d)(3)(vii)

Entrance Doorway. (d)(3)(viii)

Where the cutoff saw partially blocks the entrance, is the entrance guarded? (d)(3)(viii)

Mechanical Barkers. (d)(4)

Rotary Barkers. (d)(4)(i)

Are rotary barking devices so guarded as to protect employees from flying chips, bark, or other extraneous material? (d)(4)(i)

Elevating Ramp. (d)(4)(ii)

If an elevating ramp or gate is used, is it provided with a safety chain, hook, or other means of suspension while employees are underneath? (d)(4)(ii)

Area Around Barkers. (d)(4)(iii)

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(d) Log Handling, Sorting and Storage.

	YES	NO
Is the hazardous area around ring barkers and their conveyors fenced off or posted as a prohibited area for unauthorized persons? (d)(4)(iii)		
Enclosing Hydraulic Barkers. (d)(4)(iv)		
Are hydraulic barkers enclosed with strong baffles at the inlet and outlet? (d)(4)(iv)		
Is the operator protected by adequate safety glass or an equivalent? (d)(4)(iv)		
Holddown Rolls. (d)(4)(v)		
Are holddown rolls installed at the infeed and outfeed sections of mechanical ring barkers to control the movement of logs? (d)(4)(v)		
(e) Log Breakdown and Related Machinery and Facilities.		
Log Carriages and Carriage Runways. (e)(1)		
Bumpers. (e)(1)(i)		
Is a substantial stop or bumper with adequate shock-absorptive qualities installed at each end of the carriage runway? (e)(1)(i)		
Footing. (e)(1)(ii)		
Are rider-type carriages floored to provide secure footing and a firm working platform for the block setter? (e)(1)(ii)		
Sheave Housing. (e)(1)(iii)		
Are sheaves, on rope-driven carriages guarded at floor line with substantial housings? (e)(1)(iii)		
Carriage Control. (e)(1)(iv)		
Is a positive means provided to prevent unintended movement of the carriage? (e)(1)(iv)		
Barriers and Warning Signs. (e)(1)(v)		
Is a barrier provided to prevent employees from entering the space necessary for travel of the carriage? (e)(1)(v)		
Are warning signs posted at possible entry points to this area? (e)(1)(v)		
Overhead Clearance. (e)(1)(vi)		
For a rider-type carriage, is adequate overhead clear space above the carriage deck provided for the full carriage runway length? (e)(1)(vi)		
Sweeping Devices. (e)(1)(vii)		
Are carriage track sweeping devices used to keep track rails clear of debris? (e)(1)(vii)		
Dogs. (e)(1)(viii)		
Are dogging devices adequate to secure logs, cants, or boards, during sawing operations? (e)(1)(viii)		
Head Saws. (e)(2)		
Band Head Saws. (e)(2)(i)		
(a) Are band head saws prohibited from being operated at speeds in excess of those recommended by the manufacturer?		
(b) Are band head saws thoroughly inspected for cracks, splits, broken teeth, and other defects?		

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(e) Log Breakdown and Related Machinery and Facilities.

	YES	NO
Are bandsaws with a crack greater than one-tenth the width of the saw prohibited from being placed in service until width of the saw is reduced to eliminate the crack, or until the cracked section is removed, or crack development is stopped?		
(c) Are provisions made for alerting and warning employees before starting band head saws, and are measures taken to insure that all persons are in the clear? (e)(2)(i)		
Bandsaw Wheels. (e)(2)(ii)		
(a) Are precautions taken to insure that no bandsaw wheel will run at a peripheral speed in excess of that recommended by the manufacturer?		
Is the manufacturer's recommended maximum speed stamped in plainly legible figures on some portion of the wheel?		
(b) Are band head saw headwheels subjected to monthly inspections?		
Are hubs, spokes, rims, bolts, and rivets thoroughly examined in the course of such inspections?		
Are wheels considered to be unfit for service when a loose or damaged hub, a rim crack, or loose spokes are present?		
(c) Are band wheels completely encased or guarded, except for a portion of the upper wheel immediately around the point where the blade leaves the wheel, to permit the operator to observe movement of equipment?		
Are necessary ventilating and observation ports permitted?		
Are all doors or gates closed securely during operation?		
Are band saw head rigs equipped with a saw catcher or guard of substantial construction? (e)(2)(ii)		
Single Circular Head Saws. (e)(2)(iii)		
(a) Are circular head saws prohibited from being operated at speeds in excess of those specified by the manufacturer?		
Is the maximum speed etched on the saw?		
(b) Are circular head saws equipped with safety guides which can be readily adjusted without the use of hand tools?		
(c) Is the upper saw of a double circular mill provided with a substantial hood or guard?		
Is a screen or other suitable device placed so as to protect the sawyer from flying particles?		
(d) Are all circular sawmills where live rolls are not used behind the head saw, equipped with a spreader wheel or splitter? (e)(2)(iii)		
Twin Circular Head Saws. (e)(2)(iv)		
Do twin circular head saw rigs, such as scrag saws, meet the specifications for single circular head saws in the items under (iii) above? (e)(2)(iv)		
Whole-Log Sash Gang Saws (Swedish Gangs). (e)(2)(v)		
(a) Are cranks, pitman rods, and other moving parts adequately guarded?		
(b) Are feed rolls enclosed by a cover over the top, front, and open ends, except where guarded by location?		
Is the drive mechanism on feed rolls enclosed?		
(c) Are carriage cradles of whole-log sash gang saws of adequate height to prevent logs from kicking out while being loaded? (e)(2)(v)		

Resaws. (e)(3)

Band Resaws. (e)(3)(i)

Do band resaws meet the specifications for band head saws as required by the items under (2)(i) above? (e)(3)(i)

Circular Gang Resaws. (e)(3)(ii)

(a) Are banks of circular gang resaws guarded by a hood?
(b) Are circular gang resaws provided with safety fingers or other anti-kickback devices?
(c) Are circular gang resaws prohibited from being operated at speeds exceeding those recommended by the manufacturer?
(d) Are feed belts and drive pulleys guarded in accordance with the requirements of 1910.219 of this checklist?
(e) Are feed rolls guarded?
(f) Is each circular gang resaw, except self-feed saws with a live roll or wheel at the back of the saw, provided with spreaders? (e)(3)(ii)

Sash Gang Resaws. (e)(3)(iii)

Do sash gang resaws meet the safety specifications of whole-log sash gang saws in accordance with the items under (2)(v) above? (e)(3)(iii)

Trimmer Saws. (e)(4)

Maximum Speed. (e)(4)(i)

Are trimmer saws prohibited from being run at peripheral speeds in excess of those recommended by the manufacturer? (e)(4)(i)

Guards. (e)(4)(ii)

(a) Are trimmer saws guarded in front by adequate baffles to protect against flying debris, and are such guards securely bolted to a substantial frame?
(b) Are the end saws on trimmers guarded?
(c) Is the rear of trimmer saws equipped with a guard the full width of the saws and as much wider as practical? (e)(4)(ii)

Safety Stops. (e)(4)(iii)

Are automatic trimmer saws provided with safety stops or hangers to prevent saws from dropping on a table? (e)(4)(iii)

Edgers. (e)(5)

Location. (e)(5)(i)

(a) Where vertical arbor edger saws are located ahead of the main saw, are they so guarded that an employee cannot contact any part of the edger saw from his normal position?
(b) Are edgers prohibited from being located in the main roll case behind the head saws? (e)(5)(i)

Guards. (e)(5)(ii)

(a) Are the top and the openings in end and side frames of edgers adequately guarded, and are gears and chains fully housed?
(b) Are all edgers equipped with pressure feed rolls?
(c) Are pressure feed rolls on edgers suitably guarded against accidental contact? (e)(5)(ii)

Antikickback Devices. (e)(5)(iii)

(a) Are edgers provided with safety fingers or other approved methods of preventing kickbacks or guarding against them?
(b) Is a controlling device installed and located so that the operator can stop the feed mechanism without releasing the tension of the pressure rolls? (e)(5)(iii)

Operating Speed of Live Rolls. (e)(5)(iv)

Do the live rolls and tailing devices in back of the edger operate at a speed not less than the speed of the edger feed rolls? (e)(5)(iv)

Planers. (e)(6)

Guards. (e)(6)(i)

(a) Are all cutting heads guarded?
(b) Are the side head hoods of sufficient height to safeguard the head setscrew?
(c) Are pressure feed rolls and "pineapples" guarded?
(d) Are levers or controls so arranged or guarded so as to reduce the possibility of accidental operation? (e)(6)(i)

(f) Dry Kilns and Facilities.

Kiln Foundations. (f)(1)

Are dry kilns constructed upon solid foundations to prevent tracks from sagging? (f)(1)

Passageways. (f)(2)

Is a passageway provided to give adequate clearance on at least one side or in the center of end-piled kilns and on two sides of cross-piled kilns? (f)(2)

Doors. (f)(3)

Main Kiln Doors. (f)(3)(i)

(a) Are main kiln doors provided with a method of holding them open while kiln is being loaded?
(b) Are counterweights on vertical lift doors boxed or otherwise guarded?
(c) Are adequate means provided to firmly secure main doors, when they are disengaged from carriers and hangers, to prevent toppling? (f)(3)(i)

Escape Doors. (f)(3)(ii)

(a) If operating procedures require access to kilns, are kilns provided with escape doors that operate easily from the inside, swing in the direction of exit, and are located in or near the main door at the end of the passageway?
(b) Are escape doors of adequate height and width to accommodate an average size man? (f)(3)(ii)

Pits. (f)(4)

Are pits well ventilated, drained, and lighted, and are they large enough to safely accommodate the kiln operator together with operating devices such as valves, dampers, damper rods, and traps? (f)(4)

Steam Mains. (f)(5)

Are all high-pressure steam mains located in or adjacent to an operating pit covered with heat-insulating material? (f)(5)

Ladders. (f)(6)

Is a fixed ladder, in accordance with the requirements of 1910.27 of this checklist, or other adequate means provided to permit access to the roof? (f)(6)

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(f) Dry Kilns and Facilities.

YES NO

Where controls and machinery are mounted on the roof, is a permanent stairway with standard handrail installed in accordance with the requirements of 1910.24 of this checklist? (f)(6)

Chocks. (f)(7)

Is a means provided for chocking or blocking cars? (f)(7)

Kiln Tender Room. (f)(8)

Is a warm room provided for kiln employees to stay in during cold weather after leaving a hot kiln? (f)(8)

Mechanical Equipment. (f)(9)

Are all belts, pulleys, blowers, and other exposed moving equipment used in or about kilns guarded in accordance with the requirements of 1910.219 of this checklist? (f)(9)

(g) Personal Protective Equipment.

Are the requirements for personal protective equipment as specified in subpart I of this checklist complied with? (g)

(h) Sanitation Requirements.

Do the requirements of subpart L of this checklist govern sanitation practices? (h)

(i) Fire Protection.

Are the requirements of subpart L of this checklist complied with in providing the necessary fire protection for sawmills? (i)

1910.266 – PULPWOOD LOGGING

(a) Application.

General. (a)(1)

This section applies to pulpwood logging, operations of felling, limbing, marking, bucking, loading, skidding, prehauling and other operations associated with the preparation and movement of pulpwood timber from the stump to the point of delivery. The provisions of this section **do not** apply to logging operations relating to sawlogs, veneer bolts, poles, piling and other forest products. (a)(1)

(c) General Requirements.

Clothing, Personal Protective Devices, and First Aid. (c)(1)

Are gloves provided for use when working with wire rope in any form? (c)(1)(i)

Are safety boots and shoes provided in accordance with ANSI Z41.1-1967? (c)(1)(ii)

Are safety helmets provided, and are they in accordance with ANSI Z89.1-1969? (c)(1)(iii)

Is eye or face protection provided in accordance with ANSI Z87.1-1968, for use where chips and sawdust or flying particles are present? (c)(1)(iv)

Are dust masks in accordance with ANSI Z88.2-1969 provided where conditions warrant? (c)(1)(v)

Is protection against the effects of noise exposure provided when the sound levels exceed those shown in Table G-16? (See Appendix.) (c)(1)(vi)

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(c) General Requirements.

YES NO

Are first aid kits sufficient for the number of employees provided at the work site, and on all transport vehicles? (c)(1)(vii)

In all areas where poisonous snakes may exist, are snake bite kits a part of the regular first aid equipment? (c)(1)(vii)

Are first aid kits regularly inspected and replenished? (c)(1)(vii)

Handtools. (c)(2)

Are precautions taken to insure the safe condition of tools when furnished, and are employees required to inspect tools to assure safe condition? (c)(2)(i)

Are handles sound, straight and tight fitting? (c)(2)(ii)

Are driven tools dressed to remove any mushrooming? (c)(2)(iii)

Are cutting tools kept sharp and properly shaped? (c)(2)(iv)

Are wood hooks and pickaroons of good grade steel used? (c)(2)(v)

Are tools used for the purposes for which they were designed? (c)(2)(vi)

Are handtools sheathed or boxed if transported in a vehicle with personnel? (c)(2)(vii)

Are proper storage facilities provided for handtools? (c)(2)(viii)

Are tools stored in the provided location at all times when not in use? (c)(2)(viii)

Are periodic inspections made to assure all tools are serviceable and that all others are removed from use? (c)(2)(ix)

Environmental Conditions. (c)(3)

Is all work terminated and are employees moved to a place of safety during electrical storms and periods of high winds, or other unusual weather conditions that are present? (c)(3)(i)

Are all dead, broken, or rotted limbs or trees that are a hazard felled or otherwise removed before commencing logging operations, building roads, trails or landing, in their vicinity? (c)(3)(ii)

Work Areas. (c)(4)

Are all persons instructed to work within the vocal range of other workmen unless a procedure has been established for periodically checking their location and welfare? (c)(4)(i)

Are all men accounted for at the end of each work day? (c)(4)(ii)

Is an approved fire extinguisher provided at locations where machines are operating and/or on each vehicle? (c)(4)(iii)

Is fuel stored only in approved well-marked containers located for safe access for fueling vehicles and equipment, and at a safe distance from all fire hazards? (c)(4)(iv)

Chain Saw Operations. (c)(5)

Are chain saw operators required to daily inspect the saws to assure that all handles and guards are in place and tight, and that all controls function properly, and that the muffler is operative? (c)(5)(i)

1910.266 – PULPWOOD LOGGING
(c) General Requirements.

	YES	NO
Are chain saw operators required to follow manufacturer's instructions as to operation and adjustment? (c)(5)(ii)		
Are chain saw operators instructed to fuel the saw only in safe areas, and not under conditions conducive to fire, such as near men smoking, hot engine, etc.? (c)(5)(iii)		
Are chain saw operators instructed to hold the saw with both hands during operation? (c)(5)(iv)		
Are chain saw operators instructed to start the saw at least 10 feet away from fueling area? (c)(5)(v)		
Are chain saw operators instructed to start the saw only on the ground, or when otherwise firmly supported? (c)(5)(vi)		
Are chain saw operators instructed to be certain of footing and to clear away brush which might interfere before starting to cut? (c)(5)(vii)		
Are chain saw operators instructed not to use engine fuel for starting fires or as a cleaning solvent? (c)(5)(viii)		
Are chain saw operators instructed to shut off the saw when carrying it for a distance greater than from tree to tree, or in hazardous conditions such as slippery surfaces or heavy underbrush? (c)(5)(ix)		
Is the saw at idle speed when carried short distances? (c)(5)(ix)		
Are chain saw operators instructed to carry the saw in a manner to prevent contact with the chain and muffler? (c)(5)(x)		
Are chain saw operators instructed not to use the saw to cut directly overhead or at a distance that would require the operator to relinquish a safe grip on the saw? (c)(5)(xi)		
Stationary and Mobile Equipment Operation. (c)(6)		
Are equipment operators instructed as to the manufacturer's recommendations for equipment operation, maintenance, safe practices, and site operating procedures?(c)(6)(i)		
Is equipment kept free of flammable material? (c)(6)(ii)		
Is equipment kept free of any material which might contribute to slipping and falling? (c)(6)(iii)		
Are engines of equipment shut down during fueling, servicing, and repairs except where the operation is required for adjustment? (c)(6)(iv)		
Is equipment inspected for evidence of failure or incipient failure? (c)(6)(v)		
Is the equipment operator instructed to walk completely around the machine and assure that no obstacles or personnel are in the area before startup? (c)(6)(vi)		
Is the equipment operator instructed to start and operate equipment only from the operator's station or from a safe area recommended by the manufacturer? (c)(6)(vii)		
Are seat belts provided on mobile equipment? (c)(6)(viii)		
Is the equipment operator instructed to check all controls for proper function and response before starting the work cycle? (c)(6)(ix)		
Is the equipment operator instructed to ground or secure all movable elements when not in use? (c)(6)(x)		

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(c) General Requirements.

	YES	NO
Is the equipment operator advised of the load capacity and operating speed of the equipment? (c)(6)(xi)		
Is the equipment operator advised of the stability limitations of the equipment? (c)(6)(xii)		
Is the equipment operator instructed to maintain adequate distance from other equipment and personnel? (c)(6)(xiii)		
Where signalmen are used, is the equipment operator instructed to operate the equipment only on signal from the designated signalman and only when signal is distinct and clearly understood? (c)(6)(xiv)		
Is the equipment operator instructed not to operate movable elements (boom, grapple, load, etc.) close to or over personnel? (c)(6)(xv)		
Is the equipment operator instructed to signal his intention before operation when personnel are in or near the working area? (c)(6)(xvi)		
Is the equipment operator instructed to dismount and stand clear for all loading and unloading of his mobile vehicle by other mobile equipment? (c)(6)(xvii)		
Is the dismounted operator visible to the loader operator? (c)(6)(xvii)		
Is the equipment operator instructed to operate equipment in a manner that will not place undue shock loads on wire rope? (c)(6)(xviii)		
Is the equipment operator instructed not to permit riders or observers on the machine unless approved seating and protection is provided? (c)(6)(xix)		
Is the equipment operator instructed to shut down the engine when the equipment is stopped, apply brake locks and ground moving elements before he dismounts? (c)(6)(xx)		
Is the equipment operator instructed, when any equipment is transported from one job location to another, to transport it on a vehicle of sufficient rated capacity, and is the equipment properly secured during transit? (c)(6)(xxi)		
When any equipment is being moved or operated in the vicinity of an electric distribution line, is a minimum clearance of 10 feet maintained between the electric distribution line and all elements of the machine? (c)(6)(xxii)		
Explosives. (c)(7)		
Are only trained and experienced personnel allowed to handle or use explosives? (c)(7)		
Does the usage comply with the requirements of 1910.109? (c)(7)		
(d) Equipment Protective Devices - Stationary and Mobile Equipment.		
Operator's Manual. (d)(1)		
Is there an operator's manual or operating instructions with each machine? (d)(1)		
Does it describe operation, maintenance, and safe practices? (d)(1)		

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(d) Equipment Protective Devices – Stationary and Mobile Equipment.

YES NO

Protective Canopy. (d)(2)

Is a protective canopy provided for the operator of mobile equipment, and is it so constructed as to protect the operator from injury due to falling trees or limbs, saplings or branches which might enter the compartment side areas, and snapping winch lines or other objects? (d)(2)

Is the canopy of adequate size so as not to impair the operator's movements? (d)(2)(i)

Regardless of the type of construction used, is the fabrication and method of connecting to the tractor of such design as to develop a strength equivalent to the upright members? (d)(2)(ii)

Is the overhead covering of solid material, and does it extend the full width of the canopy? (d)(2)(iii)

Is the lower portion of the cab completely enclosed with solid material, except at entrances, to prevent the operator from being injured from obstacles entering the cab? (d)(2)(iv)

Is the upper rear portion of the cab fully enclosed with open mesh material, with openings of such size as to reject the entrance of an object larger than 1¾ inch in diameter? (d)(2)(v)

Does it provide maximum rearward visibility? (d)(2)(v)

Is open mesh extended forward as far as possible from the rear corners of the cab sides so as to give the maximum protection against obstacles, branches, etc., entering the cab area? (d)(2)(vi)

Are deflectors also installed ahead of the operator to deflect whipping saplings and branches? (d)(2)(vii)

Are these located so as to not impede ingress or egress from the compartment? (d)(2)(vii)

Is the entrance opening of the canopy at least 52 inches in vertical height? (d)(2)(viii)

Where glass is used, is it safety glass?

(a) Is an additional metal screen used where glass alone is not adequate operator protection?

(b) Are provisions made to clean glass to assure adequate visibility? (d)(2)(ix)

1910.266 – PULPWOOD LOGGING

(d) Equipment Protective Devices – Stationary and Mobile Equipment.

YES NO

Guards. (d)(3)

Are guards provided for exposed moving elements such as shafts, pulleys, belts, conveyors, and gears in accordance with 1910.219 of this checklist, and ANSI B20.1-1957? (d)(3)

Are guards in place at all times the machine is in operation? (d)(3)

Mufflers. (d)(4)

Are mufflers that are provided by the manufacturer or their equivalent in place at all times the machine is in operation? (d)(4)

Guylines. (d)(5)

Are guylines arranged in such a manner that stresses will be imposed on not less than two guylines? (d)(5)

Are stumps that are used for anchoring guylines carefully chosen as to position and strength? (d)(5)

Are they tied back if necessary, and are standing trees prohibited from being used for this purpose? (d)(5)

Stability and Reliability. (d)(6)

Is crane and loader stability and boom reliability in accordance with ANSI B30.2.0-1967 and B30.5-1968? (d)(6)

(e) Pulpwood Harvesting.

Felling, General. (e)(1)

Are work areas assigned so that a tree cannot fall into an adjacent work area? (e)(1)(i)

Are workmen instructed not to approach a feller closer than twice the height of trees being felled until the feller has acknowledged the signal of approach? (e)(1)(iii)

Are lodged trees pulled to the ground at first opportunity with mechanical equipment or animal? (e)(1)(iv)

Are workers instructed not to work under a lodged tree? (e)(1)(v)

Are special precautions taken to prevent felling trees into powerlines? (e)(1)(vi)

If a tree does make contact with a powerline, is the power company immediately notified and do all personnel remain clear of the area until power company personnel advises that conditions are safe? (e)(1)(vii)

Manual Felling. (e)(2)

Is the feller instructed to plan his retreat path and clear the path as necessary before cut is started? (e)(2)(i)

Are the fellers instructed to appraise the situation for dead limbs, the lean of tree to be cut, wind conditions, location of other trees and other hazards before cut is started? (e)(2)(ii)

Are undercuts about one-third the diameter of the tree to guide the tree and reduce the possibility of splitting? (e)(2)(iii)

1910.266 – PULPWOOD LOGGING
(e) Pulpwood Harvesting.

	YES	NO
Is the back or felling cut parallel to the inner edge of the undercut and approximately 2 inches higher than the undercut? (e)(2)(iv)		
Is the saw shut off before feller starts his retreat? (e)(2)(v)		
On terrain where trees are likely to slide or roll, are fellers instructed to fell trees from the uphill side and arrange to keep the uphill from previously felled trees? (e)(2)(vi)		
Bucking. (e)(3)		
Is bucking on slopes accomplished from the uphill side, unless the log has been securely blocked to prevent rolling or swinging? (e)(3)(i)		
Are spring poles and trees under stress cut so that an employee is clear when the tension is released? (e)(3)(ii)		
Are trees piled for bucking piled in an orderly parallel manner that minimizes hazard to employees? (e)(3)(iii)		
Limbing. (e)(4)		
Are spring poles and limbs under stress cut in such a manner that the employee is clear when tension is released? (e)(4)		
Mechanical Debarking and Delimbing. (e)(5)		
Is guarding provided as to protect employees from flying chunks, logs, chips, bark, limbs, and other material and to prevent the worker from contacting moving parts? (e)(5)		
Skidding and Prehauling, General. (e)(6)		
Is only a designated, trained operator allowed to operate a skid or prehaul machine? (e)(6)(i)		
Do choker setters work on uphill side of log? (e)(6)(ii)		
Are no passenger personnel allowed to ride on a prehaul vehicle, logs, pallets, skid pans or other load unless adequate seating and protection is provided? (e)(6)(iii)		
Are chokers positioned near the end of the log or tree length to allow turning of the prehaul vehicle? (e)(6)(iv)		
During winching, is the equipment positioned so that the winch line is in alignment with the long axis of the prehaul machine? (e)(6)(v)		
Is a stuck or inoperative vehicle towed? (e)(6)(vi)		
Is the addition of stakes prohibited to permit a load beyond the rated capacity of the pallets and trailers? (e)(6)(vii)		
Are the operators instructed to be observant and cautious of height of load and vehicle when traveling under trees, limbs, and other overhead obstructions? (e)(6)(viii)		
Skidding and Prehauling Equipment Requirements. (e)(7)		
Are arches, fairleads, drawbars, hitches and bumpers or fenders designed and constructed to allow a minimum radius vehicle turn without the load contacting a rear tire or the rear of a track assembly? (e)(7)(i)		
Is towed equipment such as skid pans, pallets and trailers attached in such a manner as to allow a full 90° turn, and prevent overrunning of the towed vehicle? (e)(7)(ii)		
Is animal towed equipment equipped with a hand brake within reach of the driver? (e)(7)(iii)		

1910.266 – PULPWOOD LOGGING
(e) Pulpwood Harvesting.

	YES	NO
Do prehaulers have a means for securely retaining pallets or pulpwood? (e)(7)(iv)		
Do prehaulers have a means of securely retaining a loader for transport when so equipped? (e)(7)(v)		
Are provisions made to securely fasten and to protect all tools and material on the carrier? (e)(7)(vi)		
Personnel Transport. (e)(8)		
Is the driver properly licensed? (e)(8)(i)		
Are flammable liquids prohibited from being transported on personnel carriers unless a safe and adequate compartment is provided? (e)(8)(ii)		
Are seats securely fastened? (e)(8)(iii)		
Manual Loading. (e)(10)		
Is the carrier positioned to provide safe working clearance between carrier and pile? (e)(10)(i)		
Are proper lifting techniques used? (e)(10)(ii)		
Is the stick placed in the carrier in such a manner that it is or will be properly secured? (e)(10)(iii)		
Is manual handling limited to a weight consistent with safe practices? (e)(10)(iv)		
Machine Loading. (e)(11)		
Are piles located to provide a safe work area? (e)(11)(i)		
Is only the machine operator and slingman, where used, in the work area? (e)(11)(ii)		
Is the load positioned for balance and to prevent slippage or loss? (e)(11)(iii)		
Are slings placed to secure and balance the load? (e)(11)(iii)		
Storage. (e)(12)		
Are piles located and constructed in a manner to provide safe working area around them? (e)(12)		
Banding and Piling Bundles. (e)(13)		
Are steel bands in good condition used? (e)(13)(i)		
Are bands placed on the bundle when the bundle is close to the ground? (e)(13)(ii)		
Are employees prohibited from placing any part of the body under the bundle? (e)(13)(iii)		
Are bundles placed on runners? (e)(13)(iii)		
Chipping (in-woods locations). (e)(14)		
Are access covers or doors prohibited from being opened until the drum or disk is at a complete stop? (e)(14)(i)		
Are infeed and discharge ports designed to prevent contact by personnel with disk, knives, or blower blades? (e)(14)(ii)		

1910.266 – PULPWOOD LOGGING

(e) Pulpwood Harvesting.

YES NO

Roads and Trails, General. (e)(15)

Are roads maintained and hazardous conditions corrected? (e)(15)(i)

Where vision is limited, are warnings posted? (e)(15)(ii)

Is the curve radii the maximum consistent with the terrain? (e)(15)(iii)

When nightwork is necessary, is adequate lighting provided? (e)(15)(iv)

Are local road standards and maximum weight of traffic expected used as guides for materials, construction features and drainage? (e)(15)(v)

Road and Trail Pioneering and Earthwork. (e)(16)

Are banks at the borrow area sloped to prevent slides? (e)(16)(i)

Is backfill adequately compacted? (e)(16)(ii)

Are roadside banks sloped or stabilized to prevent slides? (e)(16)(iii)

Are overhanging banks, large rocks and debris removed or secured? (e)(16)(iv)

Where riprap is used, does the material and design assure safe containment of the material? (e)(16)(v)

Are trees or snags which may fall into the road felled? (e)(16)(vi)

Road and Trail Drainage. (e)(17)

Is drainage provided to prevent washouts and landslides? (e)(17)(i)

Are culverts of adequate strength and of a size to handle maximum runoff? (e)(17)(ii)

Where necessary, are ditches and banks stabilized by vegetation, riprap or other adequate means? (e)(17)(iii)

Road and Trail Surfacing. (e)(18)

Are road surfaces properly compacted, graded and crowned? (e)(18)

Bridges. (e)(19)

Does construction provide for maximum anticipated loads and side thrust with a substantial safety factor? (e)(19)(i)

Are bridges decked and curbed? (e)(19)(ii)

1910.267 – AGRICULTURAL OPERATIONS

These standards have been transferred to 1928.21. (No longer a part of General Industry Standards.) Note that the field sanitation standard (1928.110) appears on page J-08 under Subpart J, General Environment Controls. For convenience, we include the following:

Does sanitation in temporary labor camps comply with the items under 1910.142 of this checklist? (a)(2)

Does the storage and handling of anhydrous ammonia comply with the items under 1910.111 (a) and (b) of this checklist? (a)(3)

Do pulpwood logging operations comply with 1910.266 of this checklist? (a)(4)

Are slow-moving vehicles marked in accordance with 1910.145 of this checklist? (a)(5)

• 1910.268 – TELECOMMUNICATIONS

YES NO

For definitions as used in this checklist, please see pages R(a)-02 of the Self-Inspection Appendix. (s)

(a) **Application.** (a)

This section sets forth safety and health standards that apply to the work conditions, practices, means, methods, operations, installations and processes performed at telecommunications centers and at telecommunications field installations, which are located outdoors or in building spaces used for such field installations. "Center" work includes the installation, operation, maintenance, rearrangement, and approval of communications equipment and other associated equipment in telecommunications switching centers. "Field" work includes the installation, operation, maintenance, rearrangement, and removal of conductors and other equipment used for signal or communication service, and of their supporting or containing structures, overhead or underground, on public or private rights of way, including buildings or other structures. (a)(1)

These standards do not apply:

To construction work, as defined in 1910.12; (a)(2)(i)

To installations under the exclusive control of electric utilities used for the purpose of communications or metering, or for generation, control, transformation, transmission, and distribution of electric energy which are located in buildings used exclusively by the electric utilities for such purposes, or located outdoors on property owned or leased by the electric utilities or on public highways, streets, roads, etc., or outdoors by established rights on private property. (a)(2)(ii)

NOTE: Operations or conditions not specifically covered by this section are subject to all the applicable standards contained in this Part 1910. See 1910.5(c). Operations which involve construction work, as defined in 1910.12 are subject to all the applicable standards contained in Part 1926. (a)(3)

(b) **General.** (b)

Buildings Containing Telecommunications Centers. (b)(1)

Is lighting in telecommunication centers provided in an adequate amount such that continuing work operations, routine observations, and the passage of employees can be carried out in a safe and healthful manner? (b)(1)(i)

Is a higher level of illumination provided when conditions warrant, such as splicing cable and the maintenance and repair of equipment frame lineups? (b)(1)(i)

Are guard rails and toe boards provided on distribution frame mezzanine platforms? (b)(1)(ii)

NOTE: To permit access to equipment, they may be omitted on the side or sides of the platform facing the frames and only on those portions of the platform adjacent to equipment frames.

Are "maintenance aisles" or "wiring aisles" between equipment frame lineups utilized as working spaces and not used as a means of egress? (b)(1)(iii)

When blastproof or power actuated doors are installed in specially designed hardsite security buildings and spaces, are they designed and installed so that they can be used as a means of egress in emergencies? (b)(1)(iv)

• Added 3/80

When power plant machinery is operated with commutators and couplings uncovered, is the adjacent housing clearly marked to alert personnel to the rotating machinery? (b)(1)(v)

Battery Handling. (b)(2)

Are eye protection devices which provide side as well as frontal eye protection provided and use ensured when employees are engaged in measuring storage battery specific gravity or handling electrolyte? (b)(2)(i)

Are acid resistant gloves and aprons provided and their use assured for protection against spattering? (b)(2)(i)

Are facilities for quick drenching or flushing of the eyes and body provided? (b)(2)(i)

NOTE: If the storage batteries are of the enclosed type and equipped with explosion proof vents, a sealed water rinse or neutralizing packs may be substituted for the quick drenching or flushing facilities.

Are employees assigned to work with storage batteries instructed in emergency procedures such as dealing with accidental acid spills? (b)(2)(i)

Is electrolyte (acid or base, and distilled water) for battery cells mixed in a well ventilated room? (b)(2)(ii)

Are precautions taken to ensure that: (b)(2)(ii)

Acid or base is poured gradually, while stirring, into the water? Water is never poured into concentrated (greater than 75%) acid solutions?

Electrolyte is never placed in metal containers nor stirred with metal objects?

When taking specific gravity readings, is the open end of the hydrometer covered with an acid resistant material while moving it from cell to cell to avoid splashing or throwing the electrolyte? (b)(2)(iii)

Medical and First Aid. (b)(3)

Are first aid supplies, recommended by a consulting physician, placed in weatherproof containers (unless stored indoors) and located so as to be easily accessible? (b)(3)

Is each first aid kit inspected at least once a month and are expended items replaced? (b)(3)

Hazardous Materials. (b)(4)

Is the total capacity of LP-gas containers limited to 100 pounds of LP-gas per work vehicle for highway mobile vehicles and trailers that are stored in garages, and are all container valves closed when not in use? (b)(4)

Compressed Gas. (b)(5)

When using or transporting nitrogen cylinders in a horizontal position, are special compartments, racks, or adequate blocking provided to prevent cylinder movement and are regulators removed or guarded before a cylinder is transported? (b)(5)

Support Structures. (b)(6)

Is the support structure of any pole structure, platform, ladder, walkway or other elevated structure or aerial device inspected by a competent person and determined safe before permitting any employee, material or equipment to be supported thereon? (b)(6)

Approach Distances to Exposed Energized Overhead Power Lines and Parts. (b)(7)

Are precautions taken to ensure that no employee approaches or takes any conductive object closer to any electrically energized overhead power lines and parts than prescribed in Table R-2* unless the following is complied with? (b)(7)

The employee is insulated or guarded from the energized parts (insulating gloves rated for the voltage involved shall be considered adequate insulation), or (b)(7)(i)

The energized parts are insulated or guarded from the employee and any other conductive object at a different potential, or (b)(7)(ii)

The power conductors and equipment are de-energized and grounded. (b)(7)(iii)

Illumination of Field Work. (b)(8)

Whenever natural light is insufficient to adequately illuminate the worksite, is artificial illumination provided to enable the employee to perform the work safely? (b)(8)

(c) **Training.** (c)

NOTE: Employers shall provide training in the various precautions and safe practices required by this section and shall insure that employees do not engage in the activities to which this section applies until they have received proper training. However, where the employer can demonstrate that an employee is already trained prior to his employment, the training need not be provided to that employee.

Where training is required, does it consist of on-the-job training or classroom-type training or a combination of both? (c)

Does the training program include a list of the subject courses and the types of personnel required to receive such instruction? (c)

Is a written description of the training program and a record of employees who have received such training maintained for the duration of the employee's employment and made available upon request to the Assistant Secretary for Occupational Safety and Health? (c)

Does the training, where appropriate, include the following subjects:

Recognition and avoidance of dangers relating to encounters with harmful substances, and animal, insect, or plant life? (c)(1)

Procedures to be followed in emergency situations? (c)(2)

First aid training, including instruction in artificial respiration? (c)(3)

(d) **Employee Protection in Public Work Areas.** (d)

Before work is begun in the vicinity of vehicular or pedestrian traffic which may endanger employees, are warning signs and/or flags or other traffic control devices placed conspicuously to alert and channel approaching traffic? (d)(1)

Are barriers utilized where further protection is needed? (d)(1)

*See Self-Inspection Appendix

1910.268 – TELECOMMUNICATIONS

YES NO

At night, are warning lights prominently displayed and are excavated areas enclosed with protective barricades? (d)(1)

If work exposes energized or moving parts that are normally protected, are danger signs displayed and barricades erected, as necessary, to warn other personnel in the area? (d)(2)

Are steps taken to insure that an employee finding any crossed or fallen wires which create or may create a hazardous situation at the work area accomplishes the following: (d)(3)

Remains on guard or adopts other adequate means to warn other employees of the danger? (d)(3)(i)

Has the proper authority been notified at the earliest practical moment? (d)(3)(ii)

(e) **Tools and Personal Protective Equipment – Generally.** (e)

Is personal protective equipment, protective devices and special tools needed for the work of employees provided and their use ensured? (e)

Before each day's use, are these personal protective devices, tools and equipment carefully inspected by a competent person to ascertain that they are in good condition? (e)

(f) **Rubber Insulating Equipment.** (f)

Is rubber insulating equipment, designed for the voltage levels to be encountered, provided and use ensured? (f)(1)

NOTE: This equipment shall meet the electrical and physical requirements contained in ANSI J6.6 – 1971 "Standard Specifications for Rubber Insulating Gloves," and ANSI J6.4 – 1971 "Standard Specifications for Rubber Insulating Blankets," with the exception that the maximun proof test current for a 14" Class I glove shall be no more than 14mA, and with the further exception that existing 14" Class I rubber gloves that meet a maximum proof test current of 16mA and a minimum breakdown voltage of 17,000 volts (RMS) acquired prior to July 1, 1975 may be used as long as these gloves comply with the retest requirements of (f)(5) below.

When these gloves are used on jobs where they may be torn, are they protected with heavy outer canvas or leather gloves? (f)(2)

Does protective equipment fabricated of material other than rubber provide electrical and mechanical protection at least equal to that of the rubber equipment? (f)(4)

Is periodic retesting (electrical, visual and mechanical) of all insulating gloves, blankets, and other rubber insulating equipment conducted within the following maximum retesting intervals? (f)(5)

Gloves, blankets, and other insulating equipment	Natural rubber	Synthetic rubber
	Months	Months
New	12	18
Re-issued	9	15

Are gloves and blankets marked to indicate compliance with the retest schedule and also marked with the date the next test is due? (f)(6)

Are gloves found to be defective destroyed by cutting them open from the finger to the gauntlet? (f)(6)

1910.268 – TELECOMMUNICATIONS

YES NO

When not being used, are insulating gloves stored in glove bags or in their original containers and are insulating blankets stored in a canister or other device which offers equivalent protection? (f)(7)

Are insulating gloves and blankets stored away from direct sunlight, steampipes, radiators and other sources of excessive heat? (f)(8)

NOTE: Gloves and blankets shall not be folded while in storage; however, blankets may be rolled for storage.

Are rubber gloves visually inspected and air tested prior to each day's use? (f)(9)

(g) **Personal Climbing Equipment.** (g)

Are safety belts and straps provided and their use ensured when work is performed at positions more than 4 feet above ground, on poles, and on towers, except as provided in (n)(7) and (8) of this section? (g)(1)

Are all safety belts and straps inspected by a competent person prior to each day's use to determine that they are in safe working condition? (g)(1)

Telecommunication Lineman's Body Belts, Safety Straps, and Lanyards. (g)(2)

Do all safety belts, safety straps and lanyards acquired after July 1, 1975 meet the following requirements? (g)(2)

General Requirements. (g)(2)(i)

Hardware for lineman's body belts, safety straps, and lanyards shall be drop forged or pressed steel and shall have a corrosion resistant finish tested to meet the requirements of the American Society for Testing and Materials B117-64 (50-hour test). Surfaces shall be smooth and free of sharp edges. Production samples of lineman's safety straps, body belts and lanyards shall be approved by a nationally recognized testing laboratory, as having been tested in accordance with and as meeting the requirements of this paragraph. (g)(2)(i)(A)

All buckles shall withstand a 2,000-pound tensile test with a maximum permanent deformation no greater than one sixty-fourth inch. (g)(2)(i)(B)

D rings shall withstand a 5,000-pound tensile test without cracking or breaking. (g)(2)(i)C)

Snaphooks shall withstand a 5,000-pound tensile test, or shall withstand a 3,000-pound tensile test and a 180° bend test. Tensile failure is indicated by distortion of the snaphook sufficient to release the keeper; bend test failure is indicated by cracking of the snaphook. (g)(2)(i)(D)

Specific Requirements. (g)(2)(ii)

All fabric used for safety straps shall be capable of withstanding an A.C. dielectric test of not less than 25,000 volts per foot "dry" for 3 minutes, without visible deterioration. (g)(2)(ii)(A)(1)

All fabric and leather used shall be tested for leakage current. Fabric or leather may not be used if the leakage current exceeds 1 milliampere when a potential of 3,000 volts is applied to the electrodes positioned 12 inches apart. (g)(2)(ii)(A)(2)

In lieu of alternating current tests, equivalent direct current tests may be performed. (g)(2)(ii)(A)(3)

YES NO

The cushion part of the body belt shall: (g)(2)(ii)(B)

Contain no exposed rivets on the inside. This provision does not apply to belts used by craftsmen not engaged in line work. (g)(2)(ii)(B)(1)

Be at least three inches in width. (g)(2)(ii)(B)(2)

Be at least five thirty-seconds (5/32) inch thick, if made of leather. (g)(2)(ii)(B)(3)

Suitable copper, steel, or equivalent liners shall be used around the bars of D-rings to prevent wear between these members and the leather or fabric enclosing them. (g)(2)(ii)(D)

All stitching shall be done with a minimum 42-pound weight nylon or equivalent thread and shall be lock stitched. Stitching parallel to an edge may not be less than three-sixteenths (3/16) inch from the edge of the narrowest member caught by the thread. The use of cross stitching on leather is prohibited. (g)(2)(ii)(E)

The keepers of snaphooks shall have a spring tension that will not allow the keeper to begin to open when a weight of 2½ pounds or less is applied, but the keepers shall begin to open when a weight of four pounds is applied. In making this determination, the weight shall be supported on the keeper against the end of the nose. (g)(2)(ii)(F)

Are safety straps, lanyards, and body belts tested in accordance with the following procedure?

Attach one end of the safety strap and lanyard to a rigid support and the other end to a 250-pound canvas bag of sand; (g)(2)(ii)(G)(1)

Allow the 250-pound canvas bag of sand to free fall 4 feet when testing safety straps and 6 feet when testing lanyards. In each case, the strap or lanyard shall stop the fall of the 250-pound bag; (g)(2)(ii)(G)(2)

Failure of the strap or lanyard shall be indicated by any breakage or slippage sufficient to permit the bag to fall free from the strap or lanyard; (g)(2)(ii)(G)(3)

The entire "body belt assembly" shall be tested using one D-ring. A safety strap or lanyard shall be used that is capable of passing the "impact loading test" described in (1) and (2) above. The body belt shall be secured to the 250-pound bag of sand at a point which simulates the waist of a man. Failure of the body belt shall be indicated by any breakage or slippage sufficient to permit the bag to fall free from the body belt. (g)(2)(ii)(G)(4)

Pole Climbers. (g)(3)

Are pole climbers prohibited from use if the gaffs are less than 1¼ inches in length as measured on the underside of the gaff? (g)(3)(i)

Are the gaffs of pole climbers covered with safety caps when not being used for their intended use? (g)(3)(i)

Are pole climbers inspected by a competent person for fractured or cracked gaffs or leg irons, loose or dull gaffs, broken straps or buckles and are any defects corrected before the climbers are used? (g)(3)(ii)

Are pole climbers inspected as required above, before each day's use and a gaff cut-out test performed at least weekly? (g)(3)(iii)

YES NO

Are pole climbers prohibited from being worn when: (g)(3)(iv)

Working in trees (specifically designed tree climbers shall be used for tree climbing)? (g)(3)(iv)(A)

Working on ladders? (g)(3)(iv)(B)

Working in an aerial lift? (g)(3)(iv)(C)

Driving a vehicle? (g)(3)(iv)(D)

Walking on rocky, hard, frozen, brushy or hilly terrain? (g)(3)(iv)(E)

(h) **Ladders.** (h)

Are precautions taken to ensure that no employee nor any material or equipment is supported or permitted to be supported on any portion of a ladder unless it is first determined, by inspections and checks conducted by a competent person, that such ladder is adequately strong, in good condition, and properly secured in place, as required in Subpart D (orange tab) and as required by the following? (h)(1)

The spacing between steps or rungs permanently installed on poles and towers shall be no more than 18 inches (36 inches on any one side). This requirement also applies to fixed ladders on towers, when towers are so equipped. Spacing between steps shall be uniform above the initial unstepped section, except where working, standing or access steps are required. Fixed ladder rungs and step rungs for poles and towers shall have a minimum diameter of 5/8". Fixed ladder rungs shall have a minimum clear width of 12 inches. Steps for poles and towers shall have a minimum clear width of 4½ inches. The spacing between detachable steps may not exceed 30 inches on any one side, and these steps shall be properly secured when in use. (h)(2)

After April 30, 1975, portable wood ladders intended for general use may not be painted but may be coated with a transclucent nonconductive coating. Portable wood ladders may not be longitudinally reinforced with metal. (h)(3)

Portable wood ladders that are not being carried on vehicles and are not in active use shall be stored where they will not be exposed to the elements and where there is good ventilation. (h)(4)

The provisions of 1910.25(c)(5) shall apply to rolling ladders used in telecommunications centers, except that such ladders shall have a minimum inside width, between the side rails, of at least eight inches. (h)(5)

Climbing ladders or stairways on scaffolds used for access and egress shall be affixed or built into the scaffold by proper design and engineering, and shall be so located that their use will not disturb the stability of the scaffold. The rungs of the climbing device shall be equally spaced, but may not be less than 12 inches nominal nor more than 16 inches nominal apart. Horizontal end rungs used for platform support may also be utilized as a climbing device if such rungs meet the spacing requirement of this paragraph (h)(6), and if there is sufficient clearance between the rung and the edge of the platform to afford an adequate handhold. If a portable ladder is affixed to the scaffold, it shall be securely attached and shall have rungs meeting the spacing requirements of this paragraph (h)(6). Clearance shall be provided in the back of the ladder of not less than 6 inches from center of rung to the nearest scaffold structural member. (h)(6)

	YES	NO
When a ladder is supported by an aerial strand, and ladder hooks or other supports are not being used, the ladder shall be extended at least 2 feet above the strand and shall be secured to it (e.g., lashed or held by a safety strap around the strand and ladder side rail). When a ladder is supported by a pole, it shall be securely lashed to the pole unless the ladder is specifically designed to prevent movement when used in this application. (h)(7)		
The following requirements apply to metal manhole ladders. (h)(8)		
Metal manhole ladders shall be free of structural defects and free of accident hazards such as sharp edges and burrs. The metal shall be protected against corrosion unless inherently corrosion-resistant. (h)(8)(i)		
These ladders may be designed with parallel side rails, or with side rails varying uniformly in separation along the length (tapered), or with side rails flaring at the base to increase stability. (h)(8)(ii)		
The spacing of rungs or steps shall be on 12-inch centers. (h)(8)(iii)		
Connections between rungs or steps and siderails shall be constructed to insure rigidity as well as strength. (h)(8)(iv)		
Rungs and steps shall be corrugated, knurled, dimpled, coated with skid-resistant material, or otherwise treated to minimize the possibility of slipping. (h)(8)(v)		
Ladder hardware shall meet the strength requirements of the ladder's component parts and shall be of a material that is protected against corrosion unless inherently corrosion-resistant. Metals shall be so selected as to avoid excessive galvanic action. (h)(8)(vi)		
(i) Other Tools and Personal Protective Equipment. (i)		
Head Protection. (i)(1)		
Is head protection meeting the requirements of ANSI Z89.2 – 1971, "Safety Requirements for Industrial Protective Helmets for Electrical Workers, Class B" provided employees and use ensured whenever there is exposure to possible high voltage electrical contact? (i)(1)		
Eye Protection. (i)(2)		
Is eye protection meeting the requirements of 1910.133(a)(2) thru (6) provided employees and use ensured where foreign objects may enter the eyes due to work operations such as but not limited to the following: (i)(2)		
Drilling or chipping stone, brick or masonry, breaking concrete or pavement, etc. by hand tools (sledgehammer, etc.) or power tools such as pneumatic drills or hammers; (i)(2)(i)		
Working on or around high speed emery or other grinding wheels unprotected by guards; (i)(2)(ii)		
Cutting or chipping terra cotta ducts, tile, etc. (i)(2)(iii)		
Working under motor vehicles requiring hammering; (i)(2)(iv)		
Cleaning operations using compressed air, steam, or sand blast; (i)(2)(v)		
Acetylene welding or similar operations where sparks are thrown off; (i)(2)(vi)		
Using powder actuated stud drivers; (i)(2)(vii)		

	YES	NO
Tree pruning or cutting underbrush; (i)(2)(viii)		
Handling battery cells and solutions, such as taking battery readings with a hydrometer and thermometer; (i)(2)(ix)		
Removing or rearranging strand or open wire; and (i)(2)(x)		
Performing lead sleeve wiping and while soldering. (i)(2)(xi)		
Tent Heaters. (i)(3)		
Are flame-type heaters prohibited from use within ground tents or on platforms within aerial tents unless: (i)(3)		
The tent covers are constructed of fire resistant materials? (i)(3)(i)		
Adequate ventilation is provided to maintain safe oxygen levels and avoid harmful buildup of combustion products and combustible gasses? (i)(3)(ii)		
Torches. (i)(4)		
Is the use of torches on aerial splicing platforms or in buckets enclosed by tents permitted only when the tent material is constructed of fire resistant material, there is adequate ventilation, and the torch is turned off when not in actual use? (i)(4)		
Portable Power Equipment. (i)(5)		
Is the output circuit completely isolated from the frame of the unit for all ungrounded portable generators (nominal 120V or less) used for providing power at work locations? (i)(5)		
Vehicle-Mounted Utility Generators. (i)(6)		
Are the following conditions met when vehicle mounted utility generators, used for providing nominal 240V AC or less for powering portable tools and equipment, are not grounded to earth: (i)(6)		
One side of the voltage source is solidly strapped to the metallic structure of the vehicle? (i)(6)(i)		
Grounding-type outlets are used, with a "grounding" conductor between the outlet grounding terminal and the side of the voltage source that is strapped to the vehicle? (i)(6)(ii)		
All metallic encased tools and equipment that are powered from this system are equipped with three-wire cords and grounding-type attachment plugs, except as designated in (i)(7) below? (i)(6)(iii)		
Portable Lights, Tools and Appliances. (i)(7)		
When operating from commercial power, are the metal parts of portable lights, tools and appliances grounded or protected by a system of double insulation, or its equivalent? (i)(7)		
NOTE: Portable lights, tools and appliances having non-current-carrying external metal housing may be used with power equipment described in (i)(5) above without an equipment grounding conductor. Equipment protected by a system of double insulation, or its equivalent shall be distinctively marked to indicate double insulation. (i)(7)		
Soldering Devices. (i)(8)		
Is grounding omitted when using soldering irons, guns or wire-wrap tools on telecommunications circuits? (i)(8)		

Lead Work. (i)(9)

NOTE: The wiping of lead joints using melted solder, gas fueled torches, soldering irons or other appropriate heating devices, and the soldering of wires or other electrical connections do not constitute the welding cutting and brazing described in Subpart Q.

When operated from commercial power, is the metal housing of electric solder pots grounded? (i)(9)

NOTE: Electric solder pots may be used with the power equipment described in (i)(5) above without a grounding conductor.

Are precautions taken to ensure that wiping gloves or cloths and eye protection are used in lead wiping operations? (i)(9)

Is a drip pan provided and used to catch hot lead drippings? (i)(9)

(j) **Vehicle-Mounted Material Handling Devices and Other Mechanical Equipment.** (j)

General. (j)(1)

Are visual inspections made of the equipment by a competent person each day the equipment is to be used to ascertain that it is in good condition? (j)(1)(i)

Are tests made at the beginning of each shift by a competent person to insure the vehicle brakes and operating systems are in proper working condition? (j)(1)(ii)

Scrapers, Loaders, Dozers, Graders and Tractors. (j)(2)

Are all rubber-tired, self propelled scrapers, rubber-tired front end loaders, rubber-tired dozers, agricultural and industrial tractors, crawler tractors, crawler-type loaders, and motor graders, with or without attachments, that are used in telecommunications work, equipped with rollover protective structures that meet the requirements of Subpart W of Part 1926? (j)(2)(i)

Is eye protection provided and use ensured when employees are working in areas where flying material is generated? (j)(2)(ii)

Vehicle-Mounted Elevating and Rotating Work Platforms. (j)(3)

Are these devices prohibited from operating with any conductive part of the equipment closer to exposed energized power lines than the clearances set forth in Table R-2*? (j)(3)

Derrick Trucks and Similar Equipment. (j)(4)

Is this equipment prohibited from being operated with any conductive part of the equipment closer to exposed energized power lines than the clearances set forth in Table R-2*? (j)(4)(i)

When derricks are used to handle poles near energized power conductors, do these operations comply with the requirements contained in (b)(7) and (n)(11) of this section? (j)(4)(ii)

Are moving parts of equipment and machinery carried on or mounted on telecommunications line trucks guarded? (j)(4)(iii)

NOTE: This may be done with barricades as specified in (d)(2)of this section.

*See Self-Inspection Appendix

Do derricks and the operation of derricks comply with the following requirements? (j)(4)(iv)

Manufacturer's specifications, load ratings and instructions for derrick operation shall be strictly observed. (j)(4)(iv)(A)

Rated load capacities and instructions related to derrick operation shall be conspicuously posted on a permanent weather-resistant plate or decal in a location on the derrick that is plainly visible to the derrick operator. (j)(4)(iv)(B)

Prior to derrick operation the parking brake must be set and the stabilizers extended if the vehicle is so equipped. When the vehicle is situated on a grade, at least two wheels must be chocked on the downgrade side. (j)(4)(iv)(C)

Only persons trained in the operation of the derrick shall be permitted to operate the derrick. (j)(4)(iv)(D)

Hand signals to derrick operators shall be those prescribed by ANSI B30.6–1969, "Safety Code for Derricks". (j)(4)(iv)(E)

The derrick and its associated equipment are inspected by a competent person at intervals set by the manufacturer but in no case less than once per year. Records shall be maintained including the dates of inspections, and necessary repairs made, if corrective action was required. (j)(4)(iv)(F)

Modifications or additions to the derrick and its associated equipment that alter its capacity or affect its safe operation shall be made only with written certification from the manufacturer, or other equivalent entity, such as a nationally recognized testing laboratory, that the modification results in the equipment being safe for its intended use. Such changes shall require the changing and posting of revised capacity and instruction decals or plates. These new ratings or limitations shall be as provided by the manufacturer or other equivalent entity. (j)(4)(iv)(G)

Wire rope used with derricks shall be of improved plow steel or equivalent. Wire rope safety factors shall be in accordance with American National Standards Institute B30.6–1969. (j)(4)(iv)(H)

Wire rope shall be taken out of service, or the defective portion removed, when any of the following conditions exist: (j)(4)(iv)(I)

The rope strength has been significantly reduced due to corrosion, pitting, or excessive heat. (j)(4)(iv)(I)(1)

The thickness of the outer wires of the rope has been reduced to two-thirds or less of the original thickness. (j)(4)(iv)(I)(2)

There are more than six broken wires in any one rope lay. (j)(4)(iv)(I)(3)

There is excessive permanent distortion caused by kinking, crushing, or severe twisting of the rope. (j)(4)(iv)(I)(4)

(k) Materials Handling and Storage. (k)

Poles. (k)(1)

When working with poles in piles or stacks, is work performed from the ends of the poles as much as possible, and precautions taken for the safety of employees at the outer end of the pole? (k)(1)

During pole hauling operations, are all loads secured to prevent displacement? (k)(1)

Are lights, reflectors and/or flags displayed on the end and sides of the load as necessary? (k)(1)

NOTE: The requirements for installation, removal, or other handling of poles in pole lines are prescribed in (n) below which pertains to overhead lines. In the case of hoisting machinery equipped with a positive stop loadholding device, it shall be permissible for the operator to leave his position at the controls (while a load is suspended) for the sole purpose of assisting in positioning the load prior to landing it. Prior to unloading steel, poles, crossarms, and similar material, the load shall be thoroughly examined to ascertain that the load has not shifted, that binders or stakes have not broken, and that the load is not otherwise hazardous to employees.

Cable Reels. (k)(2)

Are cable reels in storage checked or otherwise restrained when there is a possibility that they might accidentally roll from position? (k)(2)

(l) Cable Fault Locating and Testing. (l)

Are employees involved in using high voltages to locate trouble or test cables instructed in the precautions necessary for their own safety, and the safety of other employees? (l)(1)

Before the voltage is applied, are cable conductors isolated to the extent practicable and are employees warned, by such techniques as briefing and tagging at all affected locations, to stay clear while the voltage is applied? (l)(2)

(m) Grounding For Employee Protection – Pole Lines. (m)

Power Conductors. (m)(1)

Are electric power conductors and equipment considered as energized unless the employee can visually determine that they are bonded to one of the grounds listed in (m)(4) of this section? (m)(1)

Nonworking Open Wire. (m)(2)

Are nonworking open wire communications lines bonded to one of the grounds listed in (m)(4) of this section? (m)(2)

Vertical Power Conduit, Power Ground Wires and Street Light Fixtures. (m)(3)

Is metal power conduit on joint use poles, exposed vertical power ground wires, and street light fixtures which are below communications attachments, considered energized and tested for voltage unless the employee can visually determine that they are bonded to the communications suspension strand or cable sheath? (m)(3)(i)

If no hazardous voltage is shown by the voltage test, is a temporary bond placed between such street light fixture, exposed vertical power grounding conductor, or metallic power conduit and the communications cable strand? (m)(3)(ii)

NOTE: Temporary bonds used for this purpose shall have sufficient conductivity to carry at least 500 amperes for a period of one second without fusing. (m)(4)

Suitable Protective Grounding. (m)(4)

To be acceptable, do grounds for protective grounding meet the following:

A vertical ground wire which has been tested, found safe, and is connected to a power system multigrounded neutral or the grounded neutral of a power secondary system where there are at least three services connected? (m)(4)(i)

Communications cable sheath or shield and its supporting strand where the sheath or shield is: (m)(4)(ii)

Bonded to an underground or buried cable which is connected to a central office ground? (m)(4)(ii)(A)

Bonded to an underground metallic piping system? (m)(4)(ii)(B)

Bonded to a power system multi-grounded neutral or grounded neutral of a power secondary system which has at least three services connected? (m)(4)(ii)(C)

Guys which are bonded to the grounds specified in (m)(4)(i) and (ii) above, and which have continuity uninterrupted by an insulator? (m)(4)(iii)

If all of the preceding grounds are not available, arrays of driven ground rods where the resultant resistance to ground will be low enough to eliminate danger to personnel or permit prompt operation of protective devices? (m)(4)(iv)

Attaching and Removing Temporary Bonds. (m)(5)

When attaching grounds (bonds), is the first attachment made to the protective ground? (m)(5)

When removing bonds, is the connection to the line or equipment removed first? (m)(5)

Are insulating gloves worn during these operations? (m)(5)

Temporary Grounding of Suspension Strand. (m)(6)

Is the suspension strand grounded to the existing grounds listed in (m)(4) above when being placed on jointly used poles or during thunderstorm activity? (m)(6)(i)

Where power crossings are encountered on nonjoint lines, is the strand bonded to an existing ground listed in (m)(4) above as close as possible to the crossing? (m)(6)(ii)

NOTE: This bonding is not required where crossings are made on a common crossing pole unless there is an upward change in grade at the pole.

Where roller-type bonds are used, are they restrained so as to avoid stressing the electrical connections? (m)(6)(iii)

Are bonds between the suspension strand and the existing ground at least No. 6AWG copper? (m)(6)(iv)

Are temporary bonds left in place until the strand has been tensioned, dead ended, and permanently grounded? (m)(6)(v)

NOTE: These requirements, (m)(6)(i) thru (v), do not apply to the installation of insulated strand.

Antenna Work-Radio Transmitting Stations 3-30 MHZ. (m)(7)

Prior to grounding a radio transmitting station antenna, does the rigger in charge accomplish the following: (m)(7)(i)

Prepares a danger tag signed with his signature? (m)(7)(i)(A)

Requests the transmitting technician to shutdown the transmitter and to ground the antenna with its grounding switch? (m)(7)(i)(B)

Is notified by the transmitting technician that the transmitter has been shut down? (m)(7)(i)(C)

Tags the antenna ground switch personally in the presence of the transmitting technician after the antenna has been grounded by the transmitting technician? (m)(7)(i)(D)

Are precautions taken to ensure that power is not applied to the antenna, nor is the grounding switch opened under any circumstances while the tag is affixed? (m)(7)(ii)

Where no grounding switches are provided, are grounding sticks used, one on each side of line, and tags placed on the grounding sticks, antenna switch, or plate power switch in a conspicuous place? (m)(7)(iii)(A)

When necessary to further reduce excessive radio frequency pickup, are ground sticks or short circuits placed directly on the transmission lines near the transmitter in addition to the regular grounding switches? (m)(7)(iii)(B)

NOTE: In other cases, the antenna lines may be disconnected from ground and the transmitter to reduce pickup at the point in the field. (m)(7)(iii)(C)

Are all radio frequency line wires tested for pickup with an insulated probe before they are handled either with bare hands or with metal tools? (m)(7)(iv)

Are transmitting technicians required to warn the riggers about adjacent lines which are, or may become energized? (m)(7)(v)

When antenna work has been completed, is the rigger in charge of the job required to return to the transmitter and notify the transmitting technician in charge that work has been completed, and then personally remove the tag from the antenna ground switch? (m)(7)(vi)

(n) **Overhead Lines.** (n)

Handling Suspension Strand. (n)(1)

When handling cable suspension strand which is being installed on poles carrying exposed energized power conductors, are employees required to wear insulating gloves and avoid body contact with the strand until after it has been tensioned, dead-ended and permanently grounded? (n)(1)(i)

Is the strand restrained against upward movement during installation on:

Joint-use poles, where there is an upward change in grade at the pole? (n)(1)(ii)(A)

Non-joint-use poles, where the line crosses under energized power conductors? (n)(1)(ii)(B)

Unless temporary guys or braces are attached, are the following poles tested in accordance with (n)(3) and determined to be safe before employees are permitted to climb them: (n)(2)

Dead-end poles, except properly braced or guyed "Y" or "T" cable junction poles? (n)(2)(i)

Straight line poles which are not storm guyed and where adjacent span lengths exceed 165 feet? (n)(2)(ii)

Poles at which there is a downward change in grade and which are not guyed or braced corner poles or cable junction poles? (n)(2)(iii)

Poles which support only telephone drop wire? (n)(2)(iv)

Poles which carry less than ten communication line wires. (On joint use poles, one power line wire shall be considered as two communication wires)? (n)(2)(v)

Methods of Testing Wood Poles. (n)(3)

Are one of the following methods or an equivalent method used for testing wood poles?

Rap the pole sharply with a hammer weighing about 3 pounds, starting near the ground line and continuing upwards circumferentially around the pole to a height of approximately 6 feet. The hammer will produce a clear sound and rebound sharply when striking sound wood. Decay pockets will be indicated by a dull sound and/or a less pronounced hammer rebound. When decay pockets are indicated, the pole shall be considered unsafe. Also, prod the pole as near the ground line as possible using a pole prod or a screwdriver with a blade at least 5 inches long. If substantial decay is encountered, the pole shall be considered unsafe. (n)(3)(i)

Apply a horizontal force to the pole and attempt to rock it back and forth in a direction perpendicular to the line. Caution shall be exercised to avoid causing power wires to swing together. The force may be applied either by pushing with a pike pole or pulling with a rope. If the pole cracks during the test, it shall be considered unsafe. (n)(3)(ii)

Unsafe Poles or Structures. (n)(4)

When poles or structures are determined to be unsafe by test or observation, are they prohibited from being climbed until made safe by guying, bracing or other adequate means? (n)(4)

When poles are determined to be unsafe to climb, are they tagged in a conspicuous place to alert and warn all employees of the unsafe condition? (n)(4)

Test Requirements for Cable Suspension Strand. (n)(5)

Before attaching a splicing platform to a cable suspension strand, is the strand tested and determined to have strength sufficient to support the weight of the platform and the employee? (n)(5)(i)

NOTE: Where the strand crosses above power wires or railroad tracks it may not be tested but shall be inspected in accordance with (n)(6) of this section.

Is the following method or an equivalent method used for testing the strength of the strand? (n)(5)(ii)

A rope, at least three-eighths inch in diameter, shall be thrown over the strand. On joint lines the rope shall be passed over the strand using tree pruner handles or a wire raising tool. If two employees are present, both shall grip the double rope and slowly transfer their entire weight to the rope and attempt to raise themselves off the ground. If only one employee is present, one end of the rope which has been passed over the strand shall be tied to the bumper of the truck, or other equally secure anchorage. The employee then shall grasp the other end of the rope and attempt to raise himself off the ground. (n)(5)(ii)

Inspection of Strand. (n)(6)

Where strand passes over electric power wires or railroad tracks, is it inspected from an elevated working position at each pole supporting the span in question? (n)(6)

Is the strand not used to support any splicing platform, scaffold or cable car when any of the following conditions exist: (n)(6)

Corrosion so that no galvanizing can be detected? (n)(6)(i)

One or more wires of the strand are broken? (n)(6)(ii)

Worn spots? (n)(6)(iii)

Burn marks such as those caused by contact with electric power wires? (n)(6)(iv)

Outside Work Platforms. (n)(7)

Unless adequate railings are provided, are safety straps and body belts used while working on elevated work platforms such as aerial splicing platforms, pole platforms, ladder platforms and terminal balconies? (n)(7)

Other Elevated Locations. (n)(8)

Are safety straps and body belts worn when working at elevated positions on poles, towers or similar structures, which do not have adequately guarded work areas? (n)(8)

Installing and Removing Wire and Cable. (n)(9)

Before installing or removing wire or cable, is the pole or structure guyed, braced or otherwise supported, as necessary, to prevent failure of the pole or structure? (n)(9)

Avoiding Contact with Energized Power Conductors or Equipment. (n)(10)

When cranes, derricks, or other mechanized equipment are used for setting, moving, or removing poles, are all necessary precautions taken to avoid contact with energized power conductors or equipment? (n)(10)

Is the following complied with when handling poles near energized power conductors? (n)(11)

Joint use poles may not be set, moved, or removed where the nominal voltage of open electrical power conductors exceeds 34.5kV phase to phase (20kV to ground). (n)(11)(i)

Poles that are to be placed, moved or removed during heavy rains, sleet or wet snow in joint lines carrying more than 8.7kV phase to phase voltage (5kV to ground) shall be guarded or otherwise prevented from direct contact with overhead energized power conductors. (n)(11)(ii)

In joint lines where the power voltage is greater than 750 volts but less than 34.5kV phase to phase (20kV to ground), wet poles being placed, moved or removed shall be insulated with either a rubber insulating blanket, a fiberglass box guide, or equivalent protective equipment. (n)(11)(iii)(A)

In joint lines where the power voltage is greater than 8.7kV phase to phase (5kV to ground) but less than 34.5kV phase to phase (20kV to ground), dry poles, being placed, moved, or removed shall be insulated with either a rubber insulating blanket, a fiberglass box guide, or equivalent protective equipment. (n)(11)(iii)(B)

Where wet or dry poles are being removed, insulation of the pole is not required if the pole is cut off 2 feet or more below the lowest power wire and also cut off near the ground line. (n)(11)(iii)(C)

Insulating gloves shall be worn when handling the pole with either hands or tools, when there exists a possibility that the pole may contact a power conductor. Where the voltage to ground of the power conductor exceeds 15kV to ground, Class II gloves (as defined in ANSI J6.6–1971) shall be used. For voltages not exceeding 15kV to ground, insulating gloves shall have a breakdown voltage of at least 17kV. (n)(11)(iv)

The guard or insulating material used to protect the pole shall meet the appropriate 3 minute proof test voltage requirements contained in the ANSI J6.4–1971. (n)(11)(v)

When there exists a possibility of contact between the pole or the vehicle-mounted equipment used to handle the pole, and an energized power conductor, the following precautions shall be observed: (n)(11)(vi)

When on the vehicle which carries the derrick, avoid all contact with the ground, with persons standing on the ground, and with all grounded objects such as guys, tree limbs, or metal sign posts. To the extent feasible, remain on the vehicle as long as the possibility of contact exists. (n)(11)(vi)(A)

When it is necessary to leave the vehicle, step onto an insulated blanket and break all contact with the vehicle before stepping off the blanket and onto the ground. As a last resort, if a blanket is not available, the employee may jump cleanly from the vehicle. (n)(11)(vi)(B)

When it is necessary to enter the vehicle, first step onto an insulating blanket and break all contact with the ground, grounded objects and other persons before touching the truck or derrick. (n)(11)(vi)(C)

Working Position on Poles. (n)(12)

Is climbing and working prohibited above the level of the lowest electric power conductor on the pole (exclusive of vertical runs and street light wiring), except where: (n)(12)

Communications facilities are attached above the electric power conductors, and a rigid fixed barrier is installed between the electric power facility and the communications facility? (n)(12)(i)

YES NO

The electric power conductors are cabled secondary service drops carrying less than 300 volts to ground and are attached 40 inches or more below the communications conductors or cables? (n)(12)(ii)

Metal Tapes and Ropes. (n)(13)

Are metal measuring tapes, metal measuring ropes, or tapes containing conductive strands prohibited from use when working near exposed energized parts? (n)(13)(i)

Are only nonconductive devices used where it is necessary to measure clearances from energized parts? (n)(13)(ii)

(o) **Underground Lines.** (o)

NOTE: The provisions of this paragraph apply to the guarding of manholes and street openings, and to the ventilation and testing for gas in manholes and unvented vaults, where telecommunications field work is performed on or with underground lines.

Guarding Manholes and Street Openings. (o)(1)

When covers of manholes or vaults are removed, is the opening promptly guarded by a railing, temporary cover or other suitable temporary barrier that will prevent an accidental fall or foreign objects entering the manhole? (o)(1)(i)

Is a person with basic first aid training immediately available to render assistance while work is being performed in the manhole and there is cause for believing that a safety hazard exists? (o)(1)(ii)

NOTE: Examples of manhole worksite hazards which shall be considered to constitute a safety hazard include but are not limited to: (o)(1)(ii)

Manhole worksites where safety hazards are created by traffic patterns that cannot be corrected by provisions of paragraph (d)(1) above.

Manhole worksites that are subject to unusual water hazards that cannot be abated by conventional means.

Manhole worksites that are occupied jointly with power utilities as described in paragraph (o)(3) of this section.

Requirements Prior to Entering Manholes and Unvented Vaults. (o)(2)

Are the following precautions taken before an employee enters a manhole: (o)(2)(i)

The internal atmosphere shall be tested for combustible gas and, except when continuous forced ventilation is provided, the atmosphere shall also be tested for oxygen deficiency? (o)(2)(i)(A)

When unsafe conditions are detected by testing or other means, the work area shall be ventilated and otherwise made safe before entry? (o)(2)(i)(B)

Is an adequate continuous supply of air provided while work is performed in manholes under any of the following conditions: (o)(2)(ii)

Where combustible or explosive gas vapors have been initially detected and subsequently reduced to a safe level by ventilation? (o)(2)(ii)(A)

Where organic solvents are used in the work procedure? (o)(2)(ii)(B)

Where open flame torches are used in the work procedure? (o)(2)(ii)(C)

YES NO

Where the manhole is located in that portion of a public right of way open to vehicular traffic and/or exposed to a seepage of gas or gases? (o)(2)(ii)(D)

Where a toxic gas or oxygen deficiency is found? (o)(2)(ii)(E)

NOTE: The requirements of (o)(2)(i) and (ii) above do not apply to work in central office cable vaults that are adequately ventilated, but do apply to work in unvented vaults. (o)(2)(iii)

Joint Power and Telecommunication Manholes. (o)(3)

While work is being performed in a manhole occupied jointly by an electric utility and a telecommunication utility, is an employee with basic first aid training available in the immediate vicinity to render emergency assistance as may be required? (o)(3)

NOTE: The employee whose presence is required for first aid is not to be precluded from occasionally entering a manhole to provide assistance other than in an emergency. Further, this requirement does not preclude a qualified employee, working alone, from entering for brief periods of time, a manhole where energized cables or equipment are in service, for the purpose of inspection, housekeeping, taking readings, or similar work if such work can be performed safely. (o)(3)

Ladders. (o)(4)

Are ladders used to enter and exit manholes exceeding 4 feet in depth? (o)(4)

Flames. (o)(5)

When open flames are used in manholes, are the following precautions taken to protect against the accumulation of combustible gas: (o)(5)

A test for combustible gas shall be made immediately before using the open flame device, and at least once per hour while using the device? (o)(5)(i)

A fuel tank (e.g., acetylene) may not be in the manhole unless in actual use? (o)(5)(ii)

(p) **Microwave Transmission.** (p)

Eye Protection. (p)(1)

Are employees prohibited from looking into an open waveguide when it is connected to an energized source of microwave radiation? (p)(1)

Hazardous Area. (p)(2)

Are accessible areas associated with microwave communication systems posted where the electromagnetic radiation level exceeds the radiation protection guide of 1910.97 (10 mW/cm^2)? (p)(2)

Does the lower half of the posted warning symbol, required by 1910.97, include the statement, "Radiation in this area may exceed hazard limitations and special precautions are required. Obtain specific instruction before entering."? (p)(2)

YES NO

Protective Measures. (p)(3)

When an employee works in an area where the electromagnetic radiation exceeds the radiation protection guide, are measures instituted that insure that the employee's exposure is not greater than that permitted by the radiation guide? (p)(3)

NOTE: Such measures shall include, but not be limited to those of an administrative or engineering nature or those involving personal protective equipment. (p)(3)

(q) Tree Trimming – Electrical Hazards. (q)

General. (q)(1)

Are employees engaged in pruning, trimming, removing, or clearing trees from lines required to consider all overhead and underground electrical power conductors to be energized with potentially fatal voltages, never to be touched (contacted) either directly or indirectly? (q)(1)(i)

Are employees engaged in line-clearing operations instructed that: (q)(1)(ii)

A direct contact is made when any part of the body touches or contacts an energized conductor, or other energized electrical fixture or apparatus? (q)(1)(ii)(A)

An indirect contact is made when any part of the body touches any object in contact with an energized electrical conductor, or other energized fixture or apparatus? (q)(1)(ii)(B)

An indirect contact can be made through conductive tools, tree branches, trucks, equipment, or other objects, or as a result of communications wires, cables, fences, or guy wires being accidentally energized? (q)(1)(ii)(C)

Electric shock will occur when an employee, by either direct or indirect contact with an energized conductor, energized tree limb, tool, equipment, or other object, provides a path for the flow of electricity to a grounded object or to the ground itself. Simultaneous contact with two energized conductors will also cause electric shock which may result in serious or fatal injury? (q)(1)(ii)(D)

Before any work is performed in proximity to energized conductors, is the system operator/owner of the energized conductors contacted to ascertain if he knows of any hazards associated with the conductors which may not be readily apparent? (q)(1)(iii)

NOTE: This rule does not apply when operations are performed by or on behalf of the system operator/owner. (q)(1)(iii)

Working in Proximity to Electrical Hazards. (q)(2)

Is a close inspection made by the employee and by the foreman or supervisor in charge before climbing, entering, or working around any tree, to determine whether an electrical power conductor passes through the tree, or passes within reaching distance of an employee working in the tree? (q)(2)(i)

NOTE: If any of these conditions exist either directly or indirectly, an electrical hazard shall be considered to exist unless the system operator/owner has caused the hazard to be removed by deenergizing the lines, or installing protective equipment. (q)(2)(i)

YES NO

Are only qualified employees or trainees, familiar with the special techniques and hazards involved in line clearance, permitted to perform the work if it is found that an electrical hazard exists? (q)(2)(ii)

During all tree working operations aloft where an electrical hazard of more than 750V exists, is there a second employee or trainee, qualified in line clearance tree trimming, within normal voice communication? (q)(2)(iii)

Where tree work is performed by qualified employees, are the clearances from energized conductors given in Table R-3* maintained? (q)(2)(iv)

Is only appropriately insulated equipment used to remove branches hanging on an energized conductor? (q)(2)(v)

Is the employer aware that rubber footwear, including lineman's overshoes shall not be considered as providing any measure of safety from electrical hazards? (q)(2)(vi)

Are precautions taken to insure that ladders, platforms and aerial devices, are not brought in contact with an electrical conductor and that reliance is not placed on their dielectric capabilities? (q)(2)(vii)

When an aerial lift device contacts an electrical conductor, is the truck supporting the aerial lift device considered energized? (q)(2)(viii)

Storm Work and Emergency Conditions. (q)(3)

Since storm work and emergency conditions create special hazards, are only authorized representatives of the electric utility system operator/owner (not telecommunication workers) permitted to perform tree work in these situations where energized electrical power conductors are involved? (q)(3)(i)

When an emergency condition develops due to tree operations, is work suspended and the system operator/owner notified immediately? (q)(3)(ii)

*See Self-Inspection Appendix.

YES NO

(a) Scope.

This section contains requirements for the control of grain dust fires and explosions, and certain other safety hazards associated with grain handling facilities. It applies in addition to all other relevant provisions of Part 1910 (or Part 1917 at marine terminals).

(b) Application.

Paragraphs (a) through (m) of this section apply to grain elevators, feed mills, flour mills, rice mills, dust pelletizing plants, dry corn mills, soybean flaking operations, and the dry grinding operations of soycake.

Paragraphs (n), (o), and (p) of this section apply only to grain elevators.

(c) For definitions used in this checklist, see page R-v at the beginning of this section.

Emergency Action Plan.

Has the employer developed and implemented an emergency action plan that meets the requirements of Subpart E, 1910.38(a)? **(d)**

Training.

Do employees receive training at least annually and when changes in job assignments will expose them to new hazards? **(e)(1)**

Are current and new employees, prior to starting work, trained in the general safety precautions associated with the facility, including recognition and preventive measures for the hazards related to dust accumulations and common ignition sources such as smoking? **(e)(1)(i)**

Are employees trained in specific procedures that apply to their job tasks including, but not limited to, cleaning procedures for grinding equipment, cleaning procedures for choked legs, housekeeping, hot work procedures, preventive maintenance, and lockout/tagout procedures? **(e)(1)(ii)**

Are employees who are assigned special tasks, such as bin entry and handling of flammable or toxic substances, provided training to perform these tasks safely? **(e)(2)**

Are permits for all hot work issued with the exception of:

(i) Where the employer or employer's representative (who would otherwise authorize the permit) is present where hot work is performed;
(ii) In welding shops authorized by employer;
(iii) In hot work areas authorized by the employer which are located outside of the grain handling structure? **(f)(1)**

Does the permit certify that the requirements contained in 1910.252(a) have been implemented before hot work operations begin? **(f)(2)**

Is the permit kept on file until hot work operations are complete? **(f)(2)**

Entry into Bins, Silos, and Tanks.

This paragraph applies to employees entering bins, silos, and tanks. It does not apply to employees entering flat storage buildings or tanks where the diameter is greater than the height, unless entry is made from the top of the structure. **(g)**

YES NO

Before employees enter bins, silos, and tanks, has a permit been issued, unless the employer or employer's representative (who would otherwise authorize the permit) is present during the entire operation? **(g)(1)(i)**

Does the permit certify that precautions contained in 1910.272(g) have been implemented before employees enter bins, silos, or tanks? **(g)(1)(i)**

Is the permit kept on file until completion of the entry operation? **(g)(1)(i)**

Is all mechanical, electrical, hydraulic, and pneumatic equipment, which present a danger to employees inside bins, silos, or tanks, disconnected, locked-out and tagged, blocked-off, or prevented from operating by other means or methods? **(g)(1)(ii)**

Is the atmosphere within a bin, silo, or tank tested for the presence of combustible gases, vapors, and toxic agents when the employer has reason to believe they may be present? **(g)(iii)**

Is the atmosphere within a bin, silo, or tank tested for oxygen content unless there is continuous natural air movement or continuous forced-air ventilation before and during the time employees are inside? **(g)(iii)**

If the oxygen level is less than 19.5%, or if combustible gas or vapor is detected in excess of 10% of the lower flammable limit; or if toxic agents are present in excess of the ceiling values listed in Subpart Z; or if toxic agents are present in concentrations that will cause health effects which prevent employees from self-rescue or communication to obtain assistance; are the following provisions applied:

Ventilation is provided until the unsafe condition(s) are eliminated, and ventilation is continued as long as there is a chance of reoccurrence of the unsafe condition(s) while employees are inside of bins, silos, or tanks. **(g)(A)**

If toxicity of oxygen deficiency cannot be eliminated through ventilation, employees shall wear appropriate respirators that are in accordance with the requirements of 1910.134. **(g)(B)**

If employees enter bins, silos, or tanks from the top, are they required to wear a body harness with lifeline or use a boatswain's chair that meets the requirements of Subpart D? **(g)(2)**

Is an observer, equipped to provide assistance, stationed outside the bin, silo, or tank being entered by an employee? **(g)(3)**

Are communications (visual, voice, or signal line) maintained between the observer and the employee? **(g)(3)**

Is rescue equipment provided which is specifically suited for the bin, silo, or tank being entered? **(g)(4)**

Is the employee acting as observer trained in rescue procedures, including notification methods for obtaining additional assistance? **(g)(5)**

Are employees prohibited from entering bins, silos, or tanks, underneath a bridging condition, or where grain products on the side could fall and bury them? **(g)(6)**

Contractors.

Have contractors working at the grain handling facility been informed of known potential fire and explosion hazards, and have the applicable safety rules of the facility been explained? **(h)(1)**

1910.272 – GRAIN HANDLING FACILITIES	**YES**	**NO**
Have the applicable provisions of the emergency evacuation plan been explained to contractors? **(h)(2)**		
Housekeeping. Has a written housekeeping plan, which establishes the frequency and best methods determined to reduce accumulations of fugitive grain dust on ledges, floors, equipment, and other exposed surfaces, been implemented? **(i)(1)**		
Does the housekeeping program for grain elevators address fugitive grain dust accumulations at priority housekeeping areas? **(i)(2)**		
Do housekeeping priority areas include at least the following: (A) Floor areas within 35 feet (10.7 m) of inside bucket elevators; (B) Floors of enclosed areas containing grinding equipment; (C) Floors of enclosed areas containing grain dryers located inside the facility? **(i)(i)**		
In priority housekeeping areas, are fugitive grain dust accumulations removed when they exceed ⅛ inch (.32 cm), or has equivalent protection been provided through the housekeeping program? **(i)(ii)**		
Is the use of compressed air to blow dust from ledges, walls, etc., only permitted when all machinery that presents an ignition source in the area is shut down and all other known potential ignition sources in the areas are removed or controlled? **(i)(3)**		
Does the housekeeping program address the procedures for removing grain and product spills from the work area? (Note that grain and product spills are not considered fugitive grain dust accumulations.) **(i)(4)**		
Grate Openings. Are receiving-pit feed openings, such as truck or railcar receiving pits, covered by grates? **(j)**		
Is the maximum opening in the grates 2½ inches (6.35 cm)? **(j)**		
Filter Collectors. Are all fabric dust filter collectors, which are a part of a pneumatic dust collection system, equipped with a monitoring device that will indicate a pressure drop across the surface of the filter? **(k)(1)**		
Are filter collectors, installed after March 30, 1988: (i) Located outside the facility; or (ii) Located in an area inside the facility protected by an explosion protection system; or (iii) Located in an area inside the facility that is separated from other areas of the facility by construction having at least a one-hour fire resistance rating, and which is adjacent to an exterior wall and vented to the outside? **(k)(2)**		
Is the vent and ductwork designed to resist rupture due to deflagration? **(k)(2)(iii)**		

1910.272 – GRAIN HANDLING FACILITIES	**YES**	**NO**
Preventive Maintenance. Do the preventive maintenance procedures consist of the following: (i) Regularly scheduled inspections of at least the mechanical and safety control equipment associated with dryers, grain stream processing equipment, dust collection equipment, including filter collectors and bucket elevators; and (ii) Lubrication and other appropriate maintenance in accordance with manufacturers' recommendations, or as determined necessary by prior operating records? **(l)(1)**		
Are dust collection systems, which are malfunctioning or operating below designed efficiency, promptly corrected? **(l)(2)**		
Are overheated bearings and slipping or misaligned belts associated with inside bucket elevators promptly corrected? **(l)(2)**		
Are records maintained of each inspection in accordance with paragraph (l), containing the date of inspection, the name of inspectors, and the serial number (or other identifier of the equipment) specified in paragraph (l)(1)(i)? **(l)(3)**		
Have procedures been established for the use of tags and locks which will prevent the inadvertent application of energy or motion to equipment being repaired, serviced, or adjusted, which could result in employee injury? **(l)(4)**		
Are such locks and tags removed in accordance with established procedures only by the employee installing them or, if unavailable, by his or her supervisor? **(l)(4)**		
Grain Stream Processing Equipment. Has grain stream processing equipment (such as hammer mills, grinders, and pulverizers) been equipped with effective means of removing ferrous material from the incoming grain stream? **(m)**		
Emergency Escape. Are there at least two means of emergency escape from galleries (bin decks)? **(n)**		
In tunnels of existing grain elevators, is there at least one means of emergency escape? **(n)(2)**		
Are tunnels in grain elevators constructed after the effective date of this standard provided with at least two means emergency escape? **(n)(2)**		
Continuous-Flow Bulk Raw Grain Dryers. No later than April 1, 1991, are all direct heat grain dryers equipped with automatic controls that: (i) Shut off the fuel supply in case of power or flame failure or interruption of air movement through the exhaust fan; and (ii) Stop the grain from being fed into the dryer if excessive temperature occurs in the exhaust of the drying section? **(o)(1)**		
Are direct-heat grain dryers installed after March 30, 1988: (i) Located outside the grain elevator; or (ii) In an area inside the grain elevator protected by a fire or explosion suppression system; or (iii) In an area inside the grain elevator which is separated from other areas of the facility by construction having at least a one-hour fire resistance rating? **(o)(2)**		

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	YES	NO
Inside Bucket Elevators.		
Bucket elevators are not jogged to free a choked leg. **(p)(1)**		
Are all belts and lagging purchased after March 30, 1988, conductive and have a surface electrical resistance not to exceed 300 megohms? **(p)(2)**		
No later than April 1, 1991, are all bucket elevators equipped with a means of access at the head pulley section to allow inspection of the head pulley, lagging, belt, and discharged throat of the elevator head? **(p)(3)**		
Is the boot section provided with a means of access for clean-out of the boot and for inspection of boot, pulley, and belt? **(p)(3)**		
No later than April 1, 1991, bearings are mounted externally to the lag casing; or vibration monitoring, temperature monitoring, or other means to monitor the condition of those bearings mounted inside or partially inside the leg casing is provided. **(p)(4)(i)(ii)**		
No later than April 1, 1991, are bucket elevators equipped with a motion detection device which will shut down the bucket elevator when the belt speed is reduced by no more than 20% of the normal operating speed? **(p)(5)**		

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	YES	NO
No later than April 1, 1991, are bucket elevators equipped with a belt alignment monitoring device which will initiate an alarm to employees when the belt is not tracking properly? **(p)(6)(i)**		
No later than April 1, 1991, is there a means to keep the belt tracking properly, such as a system that provides constant alignment adjustment of belts? **(p)(6)(ii)**		
[Paragraphs (p)(5) and (p)(6) do not apply to grain elevators having a permanent storage capacity of less than one million bushels, provided that a daily visual inspection is made of bucket movement and tracking of the belt.] **(p)(7)**		
[Paragraphs (p)(4), (p)(5), and (p)(6) do not apply to bucket elevators which are equipped with an operational fire and explosion suppression system capable of protecting at least the head and boot section of the bucket elevator; or bucket elevators which are equipped with pneumatic or other dust control system that keeps the dust concentration inside the bucket elevator at least 25% below the lower explosive limit at all times during operations.] [52 FR 49625, 12/31/87, as amended at 53 FR 17696, 5/18/88.]		

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TABLE R-1 – Guard Openings

Openings in the guard or between the guard and working surface shall not be greater than the following:

Distance of opening from nip point	*Maximum width of opening*
0 to 1½	1/4
1½ to 2½	3/8
2½ to 3½	1/2
3½ to 5½	5/8
5½ to 6½	3/4
6½ to 7½	7/8
7½ to 8½	1-1/4

The measurements in Table R-1 are all in inches.

TABLE R-2 – Approach Distances to Exposed Energized Overhead Power Lines and Parts

Voltage range (phase to phase, RMS)	*Approach distance (inches)*
300V and less	(1)
Over 300V, not over 750 V	12
Over 750V, not over 2kV	18
Over 2kV, not over 15kV	24
Over 15kV, not over 37kV	36
Over 37kV, not over 87.5kV	42
Over 87.5kV, not over 121kV	48
Over 121kV, not over 140kV	54

[1] Avoid contact.

TABLE R-3 – Minimum Working Distances from Energized Conductors for Line-Clearance Tree Trimmers and Line-Clearance Tree-Trimmer Trainees

Voltage range (phase to phase) (kilovolts)	*Minimum working distance*
2.1 to 15.0	2 ft. 0 in.
15.1 to 35.0	2 ft. 4 in.
35.1 to 46.0	2 ft. 6 in.
46.1 to 72.5	3 ft. 0 in.
72.6 to 121.0	3 ft. 4 in.
138.0 to 145.0	3 ft. 6 in.
161.0 to 169.0	3 ft. 8 in.
230.0 to 242.0	5 ft. 0 in.
345.0 to 362.0	7 ft. 0 in.
500.0 to 552.0	11 ft. 0 in.
700.0 to 765.0	15 ft. 0 in.

APPENDIX A TO 1910.272 GRAIN HANDLING FACILITIES

Examples presented in this appendix may not be the only means of achieving the performance goals in the standard.

1. *Scope and Application*

The provisions of this standard apply in addition to any other applicable requirements of this Part 1910 (or Part 1917 at marine terminals). The standard contains requirements for new existing grain handling facilities. The standard does not apply to seed plants which handle and prepare seeds for planting of future crops, nor to on-farm storage or feed lots.

2. *Emergency Action Plan*

The standard requires the employer to develop and implement an emergency action plan. The emergency action plan (1910.38(a)) covers those designated actions employers and employees are to take to ensure employee safety from fire and other emergencies. The plan specifies certain minimum elements which are to be addressed. These elements include the establishment of an employee alarm system, the development of evacuation procedures and training employees in those actions they are to take during an emergency.

The standard does not specify a particular method for notifying employees of an emergency. Public announcement systems, air horns, steam whistles, a standard fire alarm system, or other types of employee alarms may be used. However, employers should be aware that employees in a grain facility may have difficulty hearing an emergency alarm, or distinguishing an emergency alarm from other audible signals at the facility, or both. Therefore, it is important that the type of employee alarm used be distinguishable and distinct.

The use of floor plans or workplace maps which clearly show the emergency escape routes should be included in the emergency action plan; color coding will aid employees in determining their route assignments. The employer should designate a safe area, outside the facility, where employees can congregate after evacuation, and implement procedures to account for all employees after emergency evacuation has been completed.

It is also recommended that employers seek the assistance of the local fire department for the purpose of preplanning for emergencies. Preplanning is encouraged to facilitate coordination and cooperation between facility personnel and those who may be called upon for assistance during an emergency. It is important for emergency service units to be aware of the usual work locations of employees at the facility.

3. *Training*

It is important that employees be trained in the recognition and prevention of hazards associated with grain facilities, especially those hazards associated with their own work tasks. Employees should understand the factors which are necessary to produce a fire or explosion, i.e., fuel (such as grain dust), oxygen, ignition source, and (in the case of explosions) confinement. Employees should be made aware that any efforts they make to keep these factors from occurring simultaneously will be an important step in reducing the potential for fires and explosions.

The standard provides flexibility for the employer to design a training program which fulfills the needs of a facility. The type, amount, and frequency of training will need to reflect the tasks that employees are expected to perform. Although training is to be provided to employees at least annually, it is recommended that safety meetings or discussions and drills be conducted at more frequent intervals.

The training program should include those topics applicable to the particular facility, as well as topics such as: hot work procedures; lock-out/tag-out procedures; bin entry procedures; bin cleaning procedures, grain dust explosions, fire prevention, procedures for handling ``hot grain``, house-keeping procedures including methods and frequency of dust removal, pesticide and fumigant usage, proper use and maintenance of personal protective equipment and preventive maintenance. The types of work clothing should also be considered in the program to caution employees against using polyester clothing that easily melts and increases the severity of burns, as compared to wool or fire retardant cotton.

In implementing the training program it is recommended that the employer utilize films, slide-tape presentations, pamphlets, and other information which can be obtained from such sources as the Grain Elevator and Processing Society, the Cooperative Extension Service of the U.S. Department of Agriculture, Kansas State University's Extension Grain Science and Industry, and other state agriculture schools, industry associations, union organizations, and insurance groups.

4. *Hot Work Permit*

The implementation of a permit system for hot work is intended to assure that employers maintain control over operations involving hot work and to assure that employees are aware of and utilize appropriate safeguards when conducting these activities.

Precautions for hot work operations are specified in 29 CFR 1910.252(a), and include such safeguards as relocating the hot work operation to a safe location if possible, relocating or covering combustible material in the vicinity, providing fire extinguishers, and provisions for establishing a fire watch. Permits are not required for hot work operations conducted in the presence of the employer or the employer's authorized representative who would otherwise issue the permit, or in an employer authorized welding shop or when work is conducted outside and away from the facility.

It should be noted that the permit is not a record, but is an authorization of the employer certifying that certain safety precautions have been implemented prior to the beginning of work operations.

5. *Entry Into Bins, Silos, And Tanks*

In order to assure that employers maintain control over employee entry into bins, silos, and tanks, OSHA is requiring that the employer issue a permit for entry unless the employer (or the employer's representative who would otherwise authorize the permit) is present at the entry and during the entire operation.

Employees should have a thorough understanding of the hazards associated with entry into bins, silos, and tanks. Employees are not to be permitted to enter these spaces from the bottom when grain or other agricultural products are hung up or sticking to the sides which might fall and injure or kill an employee. Employees should be made aware that the atmosphere in bins, silos, and tanks can be oxygen deficient or toxic. Employees should be trained in the proper methods of testing the atmosphere, as well as in the appropriate procedures to be taken if the atmosphere is found to be oxygen deficient or toxic. When a fumigant has been recently applied in these areas and entry must be made, aeration fans should be running continuously to assure a safe atmosphere for those inside. Periodic monitoring of toxic levels should be done by direct reading instruments to measure the levels, and, if there is an increase in these readings, appropriate actions should be promptly taken.

Employees have been buried and suffocated in grain or other agricultural products because they sank into the material. Therefore, it is suggested that employees not be permitted to walk or stand on the grain or other grain product where the depth is greater than waist high. In this regard, employees must use a full body harness or boatswain's chair with a lifeline when entering from the top. A winch system with mechanical advantage (either powered or manual) would allow better control of the employee than just using a hand held hoist line, and such a system would allow the observer to remove the employee easily without having to enter the space.

It is important that employees be trained in the proper selection and use of any personal protective equipment which is to be worn. Equally important is the training of employees in the planned emergency rescue procedures. Employers should carefully read 1910.134(e)(3) and assure that their procedures follow these requirements. The employee acting as observer is to be equipped to provide assistance and to know procedures for obtaining additional assistance. The observer should not enter a space until adequate assistance is available. It is recommended that an employee trained in CPR be readily available to provide assistance to those employees entering bins, silos, or tanks.

6. *Contractors*

These provisions of the standard are intended to ensure that outside contractors are cognizant of the hazards associated with grain handling facilities, particularly in relation to the work they are to perform for the employer. Also, in the event of an emergency, contractors should be able to take appropriate action as a part of the overall facility emergency action plan. Contractors should also be aware of the employer's permit systems. Contractors should develop specified procedures for performing hot work and for entry into bins, silos, and tanks and these activities should be coordinated with the employer. Contractors are responsible for informing their own employees.

This coordination will help to ensure that employers know what work is being performed at the facility by contractors, where it is being performed and, that it is being performed in a manner that will not endanger employees.

7. *Housekeeping*

The housekeeping program is to be designed to keep dust accumulations and emissions under control inside grain facilities. The housekeeping program which is to be written should specify the frequency and method(s) used to best reduce dust accumulations.

Ship, barge, and rail loadout and receiving areas which are located outside the facility need not be addressed in the housekeeping program. Additionally, dump trucks which are open on two or more sides need not be addressed by the housekeeping program. Other dump trucks should be addressed in the housekeeping program to provide for regular cleaning during periods of receiving grain or agricultural products. The housekeeping program should provide coverage for all workspaces in the facility and include walls, beams, etc., especially in relation to the extent that dust could accumulate.

Dust Accumulations

Almost all facilities will require some level of manual housekeeping. Manual housekeeping methods, such as vacuuming or sweeping with soft bristle brooms, should be used which will minimize the possibility of layered dust being suspended in the air when it is being removed.

The housekeeping program should include a contingency plan to respond to situations where dust accumulates rapidly due to a failure of a dust enclosure hood, an unexpected breakdown of the dust control system, a dust-tight connection inadvertently knocked open, etc.

The housekeeping program should also specify the manner of handling spills. Grain spills are not considered to be dust accumulations.

A fully enclosed horizontal belt conveying system where the return belt is inside the enclosure should have inspection access such as sliding panels or doors to permit checking of equipment, checking for dust accumulations and facilitate cleaning if needed.

Dust Emissions

Employers should analyze the entire stock handling system to determine the location of dust emissions and effective methods to control or to eliminate them. The employer should make sure that holes in spouting, casings of bucket elevators, pneumatic conveying pipes, screw augers, or drag conveyor casings, are patched or otherwise properly repaired to prevent leakage. Minimizing free falls of grain or grain products by using choke feeding techniques, and utilization of dust-tight enclosures at transfer points, can be effective in reducing dust emissions.

Each housekeeping program should specify the schedules and control measures which will be used to control dust emitted from the stock handling system. The housekeeping program should address the schedules to be used for cleaning dust accumulations from motors, critical bearings and other potential ignition sources in the working areas. Also, the areas around bucket elevator legs, milling machinery and similar equipment should be given priority in the cleaning schedule. The method of disposal of the dust which is swept or vacuumed should also be planned.

Dust may accumulate in somewhat inaccessible areas, such as those areas where ladders or scaffolds might be necessary to reach them. The employer may want to consider the use of compressed air and long lances to blow down these areas frequently. The employer may also want to consider the periodic use of water and hoselines to wash down these areas. If these methods are used, they are to be specified in the housekeeping program along with the appropriate safety precautions, including the use of personal protective equipment such as eyewear and dust respirators.

Several methods have been effective in controlling dust emissions. A frequently used method of controlling dust emissions is a pneumatic dust collection system. But the installation of a poorly designed pneumatic dust collection system has fostered a false sense of security and has often led to an inappropriate reduction in manual housekeeping. Therefore, it is imperative that the system be designed properly and installed by a competent contractor. Those employers who have a pneumatic dust control system that is not working according to expectations should request the engineering design firm, or the manufacturer of the filter and related equipment, to conduct an evaluation of the system to determine tne corrections necessary for proper operation of the system. If the design firm or manufacturer of the equipment is not known, employers should contact their trade association for recommendations of competent designers of pneumatic dust control systems who could provide assistance.

When installing a new or upgraded pneumatic control system, the employer should insist on an acceptance test period of 30 to 45 days of operation to ensure that the system is operating as intended and designed. The employer should also obtain maintenance, testing, and inspection information from the manufacturer to ensure that the system will continue to operate as designed.

Aspiration of the leg, as part of a pneumatic dust collection system, is another effective method of controlling dust emissions. Aspiration of the leg consists of a flow of air across the entire boot, which entrains the liberated dust and carries it up the upleg to take-off points. With proper aspiration, dust concentrations in the leg can be lowered below the lowest explosive limit. When a prototype leg installation has been instrumented and shown to be effective in keeping the dust level 25% below the lower explosive limit during normal operations for the various products handled, the other legs of similar size, capacity and products being handled which have the same design criteria for the air aspiration would be considered acceptable to OSHA, provided the prototype test report is available on site.

Another method of controlling dust emissions is enclosing the conveying system, pressurizing the general work area, and providing a lower pressure inside the enclosed conveying system. Although this method is effective in controlling dust emissions from the conveying system, adequate access to the inside of the enclosure is necessary to facilitate frequent removal of dust accumulations. This is also necessary for those systems called ‘‘self-cleaning.’’

The use of edible oil sprayed on or into a moving stream of grain is another method which has been used to control dust emissions. Tests performed using this method have shown that the oil treatment can reduce dust emissions. Repeated handling of the grain may necessitate additional oil treatment to prevent liberation of dust. Be aware, however, before using this method that operators of grain handling facilities must have approval from the Food and Drug Administration of the specific oil treatment used on products for food or feed.

As a part of the housekeeping program, grain elevators are required to address accumulations of dust at priority areas using the action level. The standard specifies a maximum accumulation of 1/8 inch dust, measurable by a ruler or other measuring device, anywhere within a priority area as the upper limit at which time employers must initiate action to remove the accumulations using designated means or methods. Any accumulation in excess of this amount and where no action has been initiated to implement cleaning would constitute a violation of the standard, unless the employer can demonstrate equivalent protection. Employers should make every effort to minimize dust accumulations on exposed surfaces since dust is the fuel for a fire or explosion, and it is recognized that a 1/8 inch dust accumulation is more than enough to fuel such occurrences.

8. *Filter Collectors*

Proper sizing of filter collectors for the pneumatic dust control system they serve is very important for the overall effectiveness of the system. The air to cloth ratio of the system should be in accordance with the manufacturer’s recommendations. If higher ratios are used, they can result in more maintenance on the filter, shorter bag or sock life, increased differential pressure resulting in higher energy costs, and an increase in operational problems.

A photohelic gauge, magnehelic gauge, or manometer, may be used to indicate the pressure rise across the inlet and outlet of the filter. When the pressure exceeds the design value for the filter, the air volume will start to drop, and maintenance will be required. Any of these three monitoring devices is acceptable as meeting paragraph (k)(1) of the standard.

The employer should establish a level or target reading on the instrument which is consistent with the manufacturer's recommendations that will indicate when the filter should be serviced. This target reading on the instrument and the accompanying procedures should be in the preventive maintenance program. These efforts would minimize the blinding of the filter and the subsequent failure of the pneumatic dust control system.

There are other instruments that the employer may want to consider using to monitor the operation of the filter. One instrument is a zero motion switch for detecting a failure of motion by the rotary discharge valve on the hopper. If the rotary discharge valve stops turning, the dust released by the bag or sock will accumulate in the filter hopper until the filter becomes clogged. Another instrument is a level indicator which is installed in the hopper of the filter to detect the buildup of dust that would otherwise cause the filter hopper to be plugged. The installation of these instruments should be in accordance with manufacturer's recommendations.

All of these monitoring devices and instruments are to be capable of being read at an accessible location and checked as frequently as specified in the preventive maintenance program.

Filter collectors on portable vacuum cleaners, and those used where fans are not part of the system, are not covered by requirements of paragraph (k) of the standard.

9. *Preventive Maintenance*

The control of dust and the control of ignition sources are the most effective means for reducing explosion hazards. Preventive maintenance is related to ignition sources in the same manner as housekeeping is related to dust control and should be treated as a major function in a facility. Equipment such as critical bearings, belts, buckets, pulleys, and milling machinery are potential ignition sources, and periodic inspection and lubrication of such equipment through a scheduled preventive maintenance program is an effective method for keeping equipment functioning properly and safely. The use of vibration detection methods, heat sensitive tape or other heat detection methods that can be seen by the inspector or maintenance person will allow for a quick, accurate, and consistent evaluation of bearings and will help in the implementation of the program.

The standard does not require a specific frequency for preventive maintenance. The employer is permitted flexibility in determining the appropriate interval for maintenance provided that the effectiveness of the maintenance program can be demonstrated. Scheduling of preventive maintenance should be based on manufacturer's recommendations for effective operation, as well as from the employer's previous experience with the equipment. However, the employer's schedule for preventive maintenance should be frequent enough to allow for both prompt identification and correction of any problems concerning the failure or malfunction of the mechanical and safety control equipment associated with bucket elevators, dryers, filter collectors and magnets. The pressure-drop monitoring device for a filter collector, and the condition of the lagging on the head pulley, are examples of items that require regularly scheduled inspections. A system of identifying the date, the equipment inspected and the maintenance performed, if any, will assist employers in continually refining their preventive maintenance schedules and identifying equipment problem areas. Open work orders where repair work or replacement is to be done at a designated future date as scheduled, would be an indication of an effective preventive maintenance program.

It is imperative that the prearranged schedule of maintenance be adhered to regardless of other facility constraints. The employer should give priority to the maintenance or repair work associated with safety control equipment, such as that on dryers, magnets, alarm and shut-down systems on bucket elevators, bearings on bucket elevators, and the filter collectors in the dust control system. Benefits of a strict preventive maintenance program can be a reduction of unplanned downtime, improved equipment performance, planned use of resources, more efficient operations, and, most importantly, safer operations.

The standard also requires the employer to develop and implement procedures consisting of locking out and tagging equipment to prevent the inadvertent application of energy or motion to equipment being repaired, serviced, or adjusted, which could result in employee injury. All employees who have responsibility for repairing or servicing equipment, as well as those who operate the equipment, are to be familiar with the employer's lock and tag procedures. A lock is to be used as the positive means to prevent operation of the disconnected equipment. Tags are to be used to inform employees why equipment is locked out. Tags are to meet requirements in 1910.145(f). Locks and tags may only be removed by employees that placed them, or by their supervisor, to ensure the safety of the operation.

10. *Grain Stream Processing Equipment*

The standard requires an effective means of removing ferrous material from grain streams so that such material does not enter equipment such as hammer mills, grinders and pulverizers. Large foreign objects, such as stones, should have been removed at the receiving pit. Introduction of foreign objects and ferrous material into such equipment can produce sparks which can create an explosion hazard. Acceptable means for removal of ferrous materials include the use of permanent or electromagnets. Means used to separate foreign objects and ferrous materrial should be cleaned regularly and kept in good repair as part of the preventive maintenance program in order to maximize their effectiveness.

11. *Emergency Escape*

The standard specifies that at least two means of escape must be provided from galleries (bin decks). Means of emergency escape may include any available means of egress (consisting of three components, exit access, exit, and exit discharge as defined in 1910.35), the use of controlled descent devices with landing velocities not to exceed 15 ft/sec., or emergency escape ladders from galleries. Importantly, the means of emergency escape are to be addressed in the facility emergency action plan. Employees are to know the location of the nearest means of emergency escape and the action they must take during an emergency.

12. *Dryers*

Liquefied petroleum gas fired dryers should have the vaporizers installed at least ten feet from the dryer. The gas piping system should be protected from mechanical damage. The employer should establish procedures for locating and repairing leaks when there is a strong odor of gas or other signs of a leak.

13. *Inside Bucket Elevators*

Hazards associated with inside bucket elevator legs are the source of many grain elevator fires and explosions. Therefore, to mitigate these hazards, the standard requires the implementation of special safety precautions and procedures, as well as the installation of safety control devices. The standard provides for a phase-in period for many of the requirements to provide the employer time for planning the implementation of the requirements. Additionally, for elevators with a permanent storage capacity of less than one million bushels, daily visual inspection of belt alignment and bucket movement can be substituted for alignment monitoring devices and motion detection devices.

The standard requires that belts (purchased after the effective date of the standard) have surface electrical resistance not to exceed 300 megohms. Test methods available regarding electrical resistance of belts are: The American Society for Testing and Materials D257-76, Standard Test Methods for D-C Resistance or Conductance of Insulating Materials and, the International Standards Organization's #284, Conveyor Belts-Electrical Conductivity-Specification and Method of Test. When an employer has a written certification from the manufacturer that a belt has been tested using one of the above test methods, and meets the 300 megohm criteria, the belt is acceptable as meeting this standard. when using conductive belts, the employer should make certain that the head pulley and shaft are grounded through the drive motor ground or by some other equally effective means. When V-type belts are used to transmit power to the head pulley assembly from the motor drive shaft, it will be necessary to provide electrical continuity from the head pulley assembly to ground, e.g., motor grounds.

Employers should also consider purchasing new belts that are flame retardant or fire resistive. A flame resistance test for belts is contained in 30 CFR 18.65

APPENDIX B TO 1910.272 GRAIN HANDLING FACILITIES

National Consensus Standards

The following table contains a cross-reference listing of current national consensus standards which provide information that may be of assistance to grain handling operations. Employers who comply with provisions in these national consensus standards that provide equal or greater protection than those in 1910.272 will be considered in compliance with the corresponding requirements in 1910.272

Subject	National consensus standards
Grain elevators and facilities handling bulk raw agricultural commodities	ANIS/NFPA 61B
Feed mills	ANIS/NFPA 61C
Facilities handling agricultural commodities for human consumption	ANIS/NFPA 61D
Prenumatic conveying systems for agricultural commodities	ANIS/NFPA 66
Guide for explosion venting	ANIS/NFPA 68
Explosion prevention systems	ANIS/NFPA 69
Dust removal and exhaust systems	ANIS/NFPA 91

APPENDIX C TO 1910.272 GRAIN HANDLING FACILITIES

References for Further Information

The following references provide information which can be helpful in understanding the requirements contained in various provisions of the standard, as well as provide other helpful information.

1. *Accident Prevention Manual for Industrial Operations;* National Safety Council, 425 North Michigan Avenue, Chicago, Illinois 60611.
2. *Practical Guide to Elevator Design;* National Grain and Feed Association, P.O. Box 28328, Washington, DC 20005.
3. *Dust Control for Grain Elevators;* National Grain and Feed Association, P.O.Box 28328, Washington, DC 20005.
4. *Prevention of Grain Elevator and Mill Explosions;* National Academy of Sciences, Washington, DC. (Available from National Technical Information Service, Springfield, Virginia 22151.)
5. *Standard for the Prevention of Fires and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities*, NFPA 61B; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.
6. *Standard for the Prevention of Fire and Dust Explosions in Feed Mills*, NFPA 61C; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.
7. *Standard for the Prevention of Fire and Dust Explosions in the Milling of Agricultural Commodities for Human Consumption*, NFPA 61D; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.
8. *Standard for Pneumatic Conveying Systems for Handling Feed, Flour, Grain and Other Agricultural Dusts*, NFPA 66; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.
9. *Guide for Explosion Venting*, NFPA 68; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

10. *Standard on Explosion Prevention Systems,* NFPA 69; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.
11. *Safety Operations Plans;* U.S. Department of Agriculture, Washington, DC 20250.
12. *Inplant Fire Prevention Control Programs;* Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.
13. *Guidelines for Terminal Elevators;* Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.
14. *Standards for Preventing the Horizontal and Vertical Spread of Fires in Grain Handling Properties;* Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

OVERVIEW: SUBPART S

ELECTRICAL

Subpart S covers the electrical safety requirements that are necessary to ensure employee protection, including design safety standards, work practices, maintenance requirements, and special equipment requirements. This subpart applies to all workplace electrical installations and utilization equipment in or on buildings, structures, and other premises. For a more complete discussion of the applications of this subpart, see 1910.302, Electric Utilization Systems, page S-01.

Section 1910.303, General requirements, gives regulations for safe electrical installation, work methods, and work areas.

Section 1910.304, Wiring design and protection, covers the use and identification of grounded and grounding conductors; branch circuits; outside conductors; services; overcurrent protection; and grounding.

Wiring methods, components, and equipment for general use, section 1910.305, sets out requirements for wiring methods; cabinets, boxes, and fittings; switches; switchboards and panelboards; enclosures for damp or wet locations; conductors for general wiring; flexible cords and cables; portable cables over 600 volts, nominal; fixture wires; and general use appliances.

Section 1910.306, Specific purpose equipment and installations, covers electric signs and outline lighting; cranes and hoists; elevators, dumbwaiters, escalators, and moving walks; electric welders — disconnecting means; data processing systems — disconnecting means; X-ray equipment; induction and dielectric heating equipment; electrolytic cells; electrically driven or controlled irrigation machines; and swimming pools, fountains, and similar installations.

Hazardous locations, section 1910.307, covers electrical equipment and wiring in locations which are classified according to the hazardous materials present (vapors, dusts, liquids, etc.).

Section 1910.308, Special systems, covers electrical safety for high voltage locations; emergency power systems; remote control, power-limited, and signaling circuits; fire protective signaling systems; and communications systems.

Lastly, sections 1910.331 through 1910.335 cover electrical safety-related work practices.

Specific sections of the standard covered in the checklist are:

Std. No.		Page No.
1910.301	**Introduction**	S-01
1910.302	**Electric utilization systems**	S-01
1910.303	**General requirements**	S-02
1910.304	**Wiring design and protection**	S-05
1910.305	**Wiring methods, components, and equipment for general use**	S-09
1910.306	**Specific purpose equipment and installations**	S-14
1910.307	**Hazardous locations**	S-18
1910.308	**Special systems**	S-18
1910.331	**Safety-related work practices**	S-21
1910.332	**Training**	S-22
1910.333	**Selection and use of work practices**	S-22
1910.334	**Use of equipment**	S-25
1910.335	**Safeguards for personnel protection**	S-25

DEFINITIONS — SUBPART S

Definitions Applicable to this Subpart

Acceptable. An installation or equipment is acceptable to the Assistant Secretary of Labor, and approved within the meaning of this Subpart S:

If it is accepted, or certified, or listed, or labeled, or otherwise determined to be safe by a nationally recognized testing laboratory, such as, but not limited to, Underwriters' Laboratories, Inc., and Factory Mutual Engineering Corp; or

With respect to an installation or equipment of a kind which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, if it is inspected or tested by another federal agency, or by a state, municipal, or other local authority responsible for enforcing occupational safety provisions of the National Electrical Code, and found in compliance with the provisions of the National Electrical code as applied in this Subpart; or

With respect to custom-made equipment or related installations which are designed, fabricated for, and intended for use by a particular customer, if it is determined to be safe for its intended use by its manufacturer on the basis of test data which the employer keeps and makes available for inspection to the Assistant Secretary or his authorized representatives.

Accepted. An installation is "accepted" if it has been inspected and found by a nationally recognized testing laboratory to conform to specified plans or to procedures of applicable codes.

Accessible. (As applied to wiring methods.) Capable of being removed or exposed, without damaging the building structure or finish, or not permanently closed in by the structure of finish of the building. (See "concealed" and "exposed.")

Accessible. (As applied to equipment.) Admitting close approach; not guarded by locked doors, elevation, or other effective means. (See "readily accessible.")

Ampacity. Current-carrying capacity of electric conductors expressed in amperes.

Appliances. Utilization equipment, generally other than industrial, normally built in standardized sizes or types, which is installed or connected as a unit to perform one or more functions such as clothes washing, air conditioning, food mixing, deep frying, etc.

Approved. Acceptable to the authority enforcing this Subpart. The authority enforcing this Subpart is the Assistant Secretary of Labor for Occupational Safety and Health. The definition of "acceptable" indicates what is acceptable to the Assistant Secretary of Labor, and therefore approved within the meaning of this Subpart.

Approved for the Purpose. Approved for a specific purpose, environment, or application described in a particular standard requirement.

Suitability of equipment or materials for a specific purpose, environment, or application may be determined by a nationally recognized testing laboratory, inspection agency, or other organization concerned with product evaluation as part of its listing and labeling program. (See "Labeled" or "Listed.")

Armored Cable. Type AC armored cable is a fabricated assembly of insulated conductors in a flexible metallic enclosure.

Askarel. A generic term for a group of nonflammable synthetic chlorinated hydrocarbons used as electrical insulating media. Askarels of various compositional types are used. Under arcing conditions the gases produced, while consisting predominantly of noncombustible hydrogen chloride, can include varying amounts of combustible gases depending upon the askarel type.

Attachment Plug (Plug Cap)(Cap). A device which, by insertion in a receptacle, establishes connection between the conductors of the attached flexible cord and the conductors connected permanently to the receptacle.

Automatic. Self-acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature, or mechanical configuration.

Bare Conductor. See "Conductor."

Bonding. The permanent joining of metallic parts to form an electrically conductive path which will assure electrical continuity and the capacity to conduct safely any current likely to be imposed.

Bonding Jumper. A reliable conductor to assure the required electrical conductivity between metal parts required to be electrically connected.

Branch Circuit. The circuit conductors between the final overcurrent device protecting the circuit and the outlet(s).

Building. A structure which stands alone or which is cut off from adjoining structures by fire walls with all openings therein protected by approved fire doors.

Cabinet. An enclosure designed either for surface or flush mounting, and provided with a frame, mat, or trim in which a swinging door or doors are or may be hung.

Cable Tray System. A cable tray system is a unit or assembly of units or sections, and associated fittings, made of metal or other noncombustible materials forming a rigid structural system used to support cables. Cable tray systems include ladders, troughs, channels, solid bottom trays, and other similar structures.

Cablebus. Cablebus is an approved assembly of insulated conductors with fittings and conductor terminations in a completely enclosed, ventilated, protective metal housing.

Center Pivot Irrigation Machine. A center pivot irrigation machine is a multi-motored irrigation machine which revolves around a central pivot and employs alignment switches or similar devices to control individual motors.

Certified. Equipment is "certified" if it (a) has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner, or (b) is of a kind whose production is periodically inspected by a nationally recognized testing laboratary, and (c) it bears a label, tag, or other record of certification.

Circuit Breaker.

600 Volts, Nominal, or Less.

A device designed to open and close a circuit by nonautomatic means and to open the circuit automatically on a predetermined overcurrent without injury to itself when properly applied within its rating.

Over 600 Volts, Nominal.

A switching device capable of making, carrying, and breaking currents under normal circuit conditions, and also making, carrying for a specified time, and breaking currents under specified abnormal circuit conditions, such as those of short circuit.

Class I Locations.

Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations include the following:

Class I, Division 1.

A class I, Division 1 location is a location: (a) in which hazardous concentrations of flammable gases or vapors may exist under normal operating conditions; or (b) in which hazardous concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage; or (c) in which breakdown or faulty operation of equipment or processes might release hazardous concentrations of flammable gases or vapors, and might also cause simultaneous failure of electric equipment.

NOTE: This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another; interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used; locations containing open tanks or vats of volatile flammable liquids; drying rooms or compartments for the evaporation of flammable solvents; locations containing fat and oil extraction equipment using volatile flammable solvents; portions of cleaning and dyeing plants where flammable liquids are used; gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers; and all other locations where ignitible concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

Class I, Division 2.

A Class I, Division 2 location is a location (a) in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the hazardous liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; or (b) in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment; or (c) that is adjacent to a Class I, Division 1 location, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

NOTE: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors to be merit considered in determining the classification and extent of each location.

Piping without valves, checks, meters, and similar devices would not ordinarily introduce a hazardous condition even though used for flammable liquids or gases. Locations used for the storage of flammable liquids or a liquefied or compressed gases in sealed containers would not normally be considered hazardous unless also subject to other hazardous conditions.

Electrical conduits and their associated enclosures separated from process fluids by a single seal or barrier are classed as a Division 2 location if the outside of the conduit and enclosures is a nonhazardous location.

Class II Locations.

Class II locations are those that are hazardous because of the presence of combustible dust. Class II locations include the following:

Class II Division 1.

A Class II, Division 1 location is a location: (a) in which combustible dust is or may be in suspension in the air under normal operating conditions, in quantities sufficient to produce explosive or ignitible mixtures; or (b) where mechanical failure or abnormal operation of machinery or equipment might cause such explosive or ignitible mixtures to be produced, and might also provide a source of ignition through simultaneous failure of electric equipment, operation of protection devices, or from other causes; or (c) in which combustible dusts of an electrically conductive nature may be present.

NOTE: This classification may include areas of grain handling and processing plants, starch plants, sugar pulverizing plants, malting plants, hay-grinding plants, coal pulverizing plants, areas where metal dusts and powders are produced or processed, and other similar locations which contain dust producing machinery and equipment (except where the equipment is dust-tight or vented to the outside). These areas would have combustible dust in the air, under normal operating conditions, in quantities sufficient to produce explosive or ignitible mixtures. Combustible dusts which are electrically nonconductive include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and woodflour, oil meal from beans and seed, dried hay, and other organic materials which may produce combustible dusts when processed or handled. Dusts containing magnesium or aluminum are particularly hazardous and the use of extreme caution is necessary to avoid ignition and explosion.

Class II, Division 2

A Class II, Division 2 location is a location in which: (a) combustible dust will not normally be in suspension in the air in quantities sufficient to produce explosive or ignitible mixtures; and dust accumulations are normally insufficient to interfere with the normal operation of electrical equipment or other apparatus; or (b) dust may be in suspension in the air as a result of infrequent malfunctioning of handling or processing equipment, and dust accumulations resulting thereform may be ignitible by abnormal operation or failure of electrical equipment or other apparatus.

NOTE: This classification includes locations where dangerous concentrations of suspended dust would not be likely but where dust accumulations might form on or in the vicinity of electric equipment. These areas may contain equipment from which appreciable quantities of dust would escape under abnormal operation conditions or be adjacent to a Class II, Division 1 location, as described above, into which an explosive or ignitible concentration of dust may be put into suspension under abnormal operating conditions.

Class III Locations.

Class III locations are those that are hazardous because of the presence of easily ignitible fibers or flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures. Class III locations include the following:

Class III, Division 1.

A Class III, Division 1 location is a location in which easily ignitible fibers or materials producing combustible flyings are handled, manufactured, or used.

NOTE: Such locations usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax-processing plants; clothing manufacturing plants; woodworking plants; and establishments; and industries involving similar hazardous processes or conditions.

Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled wastekapok, Spanish moss, excelsior, and other materials of similar nature.

Class III, Division 2.

A Class III, Division 2 location is a location in which easily ignitible fibers are stored or handled, except in process of manufacture.

Collector Ring. A collector ring is an assembly of slip rings for transferring electrical energy from a stationary to a rotating member.

Concealed. Rendered inaccessible by the structure or finish of the building. Wires in concealed raceways are considered concealed, even though they may become accessible by withdrawing them. (See "Accessible. (As Applied to Wiring Methods.)")

Conductor.

Bare. A conductor having no covering or electrical insulation whatsoever.

Covered. A conductor encased within material of composition or thickness that is not recognized as electrical insulation.

Insulated. A conductor encased within material of composition and thickness that is not recognized as electrical insulation.

Conduit Body. A separate portion of a conduit or tubing system that provides access through a removable cover(s) to the interior of the system at a junction of two or more sections of the system or at a terminal point of the system. Boxes such as FS and FD or larger cast or sheet metal boxes are not classified as conduit bodies.

Controller. A device or group of devices that serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

Cooking Unit, Counter-Mounted. A cooking appliance designed for mounting in or on a counter and consisting of one or more heating elements, internal wiring, and built-in or separately mountable controls. (See "Oven, Wall-Mounted.")

Covered Conductor. (See "Conductor.")

Cutout. (Over 600 Volts, Nominal.) An assembly of a fuse support with either a fuseholder, fuse carrier, or disconnecting blade. The fuseholder or fuse carrier may include a conducting element (fuse link), or may act as the disconnecting blade by the inclusion of a nonfusible member.

Cutout Box. An enclosure designed for surface mounting and having swinging doors or covers secured directly to and telescoping with the walls of the box proper.(See "Cabinet.")

Damp Location. (See "Location.")

Dead Front. Without live parts exposed to a person on the operating side of the equipment.

Device. A unit of an electrical system which is intended to carry but not utilize electric energy.

Dielectric Heating. Dielectric heating is the heating of a nominally insulating material due to its own dielectric losses when the material is placed in a varying electric field.

Disconnecting Means. A device, or group of devices, or other means by which the conductors of a circuit can be disconnected from their source of supply.

Disconnecting (or Isolating) Switch. (Over 600 Volts, Nominal.) A mechanical switching device used for isolating a circuit or equipment from a source of power.

Dry Location. (See "Location.")

Electric Sign. A fixed, stationary, or portable self-contained, electrically illuminated utilization equipment with words or symbols designed to convey information or attract attention.

Enclosed. Surrounded by a case, housing, fence, or walls which will prevent persons from accidentally contacting energized parts.

Enclosure. The case or housing of apparatus, or the fence or walls surrounding an installation to prevent personnel from accidentally contacting energized parts, or to protect the equipment from physical damage.

Equipment. A general term including material, fittings, devices, appliances, fixtures, apparatus, and the like, used as a part of, or in connection with, an electrical installation.

Equipment Grounding Conductor. (See "Grounding Conductor, Equipment.")

Explosion-Proof Apparatus. Apparatus enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor which may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and which operates at such an external temperature that it will not ignite a surrounding flammable atmosphere.

Exposed. (As Applied to Live Parts.) Capable of being inadvertently touched or approached nearer than a safe distance by a person. It is applied to parts not suitably guarded, isolated, or insulated. (See "Accessible" and "Concealed.")

Exposed. (As Applied to Wiring Methods.) On or attached to the surface or behind panels designed to allow access. (See "Accessible" (As Applied to Wiring Method.))

Exposed. (For the purposes of 1910.308(e), Communications Systems.) Where the circuit is in such a position that in case of failure of supports or insulation, contact with another circuit may result.

Externally Operable. Capable of being operated without exposing the operator to contact with live parts.

Feeder. All circuit conductors between the service equipment, or the generator switchboard of an isolated plant, and the final branch-circuit overcurrent device.

Fitting. An accessory such as a locknut, bushing, or other part of a wiring system that is intended primarily to perform a mechanical rather than an electrical function.

Fuse. (Over 600 Volts, Nominal.) An overcurrent protective device with a circuit opening fusible part that is heated and severed by the passage of overcurrent through it. A fuse comprises all the parts that form a unit capable of performing the prescribed functions. It may or may not be the complete device necessary to connect it into an electric circuit.

Ground. A conducting connection, whether intentional or accidental, between an electrical circuit or equipment and the earth, or to some conducting body that serves in place of the earth.

Grounded. Connected to earth or to some conducting body that serves in place of the earth.

Grounded, Effectively. (Over 600 Volts, Nominal.) Permanently connected to earth through a ground connection of sufficiently low impedance and having sufficient ampacity that ground fault current which may occur can not build up to voltages dangerous to personnel.

Grounded Conductor. A system or circuit conductor that is intentionally grounded.

Grounding Conductor. A conductor used to connect equipment or the grounded circuit of a wiring system to a grounding electrode or electrodes.

Grounding Conductor, Equipment. The conductor used to connect the non-current-carrying metal parts of equipment, raceways, and other enclosures to the system grounded conductor and/or the grounding electrode conductor at the service equipment or at the source of a separately derived system.

Grounding Electrode Conductor. The conductor used to connect the grounding conductor and/or to the grounded conductor of the circuit at the service equipment or at the source of a separately derived system.

Ground-Fault Circuit-Interrupter. A device whose function is to interrupt the electric circuit to the load when a fault current to ground exceeds some predetermined value that is less than that required to operate the overcurrent protective device of the supply circuit.

Guarded. Covered, shielded, fenced, enclosed, or otherwise protected by means of suitable covers, casings, barriers, rails, mats, screens, or platforms to remove the likelihood of approach to a point of danger or contact by persons or objects.

Health Care Facilities. Buildings or portions or buildings and mobile homes that contain, but are not limited to, hospitals, nursing homes, extended care facilities, clinics, and medical and dental offices, whether fixed or mobile.

Heating Equipment. For the purpose of 1910.306(g), the term "heating equipment" includes any equipment used for heating purposes if heat is generated by induction or dielectric methods.

Hoistway. Any shaftway, hatchway, well hole, or other vertical opening or space in which an elevator or dumbwaiter is designed to operate.

Identified. Identified, as used in reference to a conductor or its terminal, means that such conductor or terminal can be readily recognized as grounded.

Induction Heating. Induction heating is the heating of a nominally conductive material due to its own 12R losses when the material is placed in a varying electromagnetic field.

Insulated Conductor. (See under "Conductor.")

Interrupter Switch. (Over 600 Volts, Nominal.) A switch capable of making, carrying, and interrupting specified currents.

Irrigation Machine. An irrigation machine is an electrically driven or controlled machine, with one or more motors, not hand portable, and used primarily to transport and distribute water for agricultural purposes.

Isolated. Not readily accessible to persons unless special means for access are used.

Isolated Power System. A system comprising an isolating transformer or its equivalent, a line isolation monitor, and its ungrounded circuit conductors.

Labeled. Equipment is "labeled" if there is attached to it a label, symbol, or other identifying mark of a nationally recognized testing laboratory which, (a) makes periodic inspections of the production of such equipment, and (b) whose labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.

Lighting Outlet. An outlet intended for the direct connection of a lampholder, a lighting fixture, or a pendant cord terminating in a lampholder.

Line-Clearance Tree Trimming. The pruning, trimming, repairing, maintaining, removing or clearing of trees or cutting of brush that is within 10 feet (305 cm) of electric supply lines and equipment.

Listed. Equipment is "listed" if it is of a kind mentioned in a list which: (a) is published by a nationally recognized laboratory which makes periodic inspection of the production of such equipment, and (b) states such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

Location.

> **Damp Location.** Partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses.
>
> **Dry Location.** A location not normally subject to dampness or wetness. A location classified as dry may be temporarily subject to dampness or wetness, as in the case of a building under construction.
>
> **Wet Location.** Installations underground or in concrete slabs or masonry in direct contact with the earth, and locations subject to saturation with water or other liquids, such as vehicle-washing areas, and locations exposed to weather and unprotected.

May. If a discretionary right, privilege or power is conferred, the word "may" is used. If a right, privilege or power is abridged or if an obligation to abstain from acting is imposed, the word "may" is used with a restrictive "no," "not" or "only". (For example, no employer may . . .; an employer may not . . .; only qualified persons may . . . .)

Medium Voltage Cable. Type MV medium voltage cable is a single or multi-conductor solid dielectric insulated cable rated 2000 volts or higher.

Metal-Clad Cable. Type MC cable is a factory assembly of one or more conductors, each individually insulated and enclosed in a metallic sheath of interlocking tape, or a smooth or corrugate tube.

Mineral-Insulated Metal-Sheathed Cable. Type MI mineral-insulated metal-sheathed cable is a factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquidtight and gastight continuous copper sheath.

Mobile X-Ray. X-ray equipment mounted on a permanent base with wheels and/or casters for moving while completely assembled.

Nonmetallic-Sheathed Cable. Nonmetallic-Sheathed cable is a factory assembly of two or more insulated conductors having an outer sheath of moisture-resistant, flame-retardant, nonmetallic material. Nonmetallic sheathed cable is manufactured in the following types:

> **Type NM.** The overall covering has a flame-retardant and moisture-resistant finish.
>
> **Type NMC.** The overall covering is flame-retardant, moisture-resistant, fungus-resistant, and corrosion-resistant.

Oil (Filled) Cutout. (Over 600 volts, Nominal.) A cutout in which all or part of the fuse support and its fuse link or disconnecting blade are mounted in oil with complete immersion of the contacts and the fusible portion of the conducting element (fuse link), so that arc interruption by severing of the fuse link or by opening of the contacts will occur under oil.

Open Wiring on Insulators. Open wiring on insulators is an exposed wiring method using cleats, knobs, tubes, and flexible tubing for the protection and support of single insulated conductors run in or on buildings, and not concealed by the building structure

Outlet. A point on the wiring system at which current is taken to supply utilization equipment.

Outline Lighting. An arrangement of incandescent lamps or electric discharge tubing to outline or call attention to certain features such as the shape of a building or the decoration of a window.

Oven, Wall-Mounted. An oven for cooking purposes designed for mounting in or on a wall or other surface and consisting of one or more heating elements, internal wiring, and built-in or separately mountable controls. (See "Cooking Unit, Counter-Mounted.")

Overcurrent. Any current in excess of the rated current of equipment or the ampacity of a conductor. It may result from overload (see definition), short circuit, or ground fault. A current in excess of rating may be accommodated by certain equipment and conductors for a given set of conditions. Hence the rules for overcurrent protection are specific for particular situations.

Overload. Operation of equipment in excess of normal, full load rating, or of a conductor in excess of rated ampacity which when it persists for a sufficient length of time, would cause damage or dangerous overheating. A fault, such as short circuit or ground fault, is not an overload. (See "Overcurrent.")

Panelboard. A single panel or group of panel units designed for assembly in the form of a single panel; including buses, automatic overcurrent devices, and with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall or partition and accessible only from the front. (See "Switchboard.")

Permanently Installed Decorative Fountains and Reflection Pools. Those that are constructed in the ground, on the ground, or in a building in such a manner that the pool cannot be readily disassembled for storage and are served by electrical circuits of any nature. These units are primarily constructed for their aesthetic value and not intended for swimming or wading.

Permanently Installed Swimming Pools, Wading and Therapeutic Pools. Those that are constructed in the ground, on the ground, or in a building in such a manner that the pool cannot be readily disassembled for storage whether or not served by electrical circuits of any nature.

Portable X-Ray. X-ray equipment designed to be hand-carried.

Power and Control Tray Cable. Type TC power and control tray cable is a factory assembly of two or more insulated conductors, with or without associated bare or covered grounding conductors under a nonmetallic sheath, approved for installation in cable trays, in raceways, or where supported by a messenger wire.

Power Fuse. (Over 600 Volts, Nominal.) See "Fuse."

Power-Limited Tray Cable. Type PLTC nonmetallic-sheathed power limited tray cable is a factory assembly of two or more insulated conductors under a nonmetallic jacket.

Power Outlet. An enclosed assembly which may include receptacles, circuit breakers, fuseholders, fused switches, buses, and watt-hour meter mounting means; intended to supply and control power to mobile homes, recreational vehicles or boats, or to serve as a means for distributing power required to operate mobile or temporarily installed equipment.

Premises Wiring System. That interior and exterior wiring, including power, lighting, control, and signal circuit wiring together with all of its associated hardware, fittings, and wiring devices, both permanently and temporarily installed, which extends from the load end of the service drop, or load end of the service lateral conductors to the outlet(s). Such wiring does not include wiring internal to appliances, fixtures, motors, controllers, motor control centers, and similar equipment.

Qualified Person. One familiar with the construction and operation of the equipment and the hazards involved.

> **Note 1:** Whether an employee is considered to be a "qualified person" will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment. (See Section 1910.332(b)(3) for training requirements that specifically apply qualified persons.)
>
> **Note 2:** An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

Raceway. A channel designed expressly for holding wires, cables, or busbars, with additional functions as permitted in this subpart. Raceways may be of metal or insulating material, and the term includes rigid metal conduit, rigid nonmetallic conduit, intermediate metal conduit, liquidtight flexible metal conduit, flexible metallic tubing, flexible metal conduit, electrical metallic tubing, underfloor raceways, cellular concrete floor raceways, cellular metal floor raceways, surface raceways, wireways, and busways.

Readily Accessible. Capable of being reached quickly for operation, renewal, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders, chairs, etc. (See "Accessible.")

Receptacle. A receptacle is a contact device installed at the outlet for the connection of a single attachment plug. A single receptacle is a single contact device with no other contact device on the same yoke. A multiple receptacle is a single device containing two or more receptacles.

Receptacle Outlet. An outlet where one or more receptacles are installed.

Remote-Control Circuit. Any electric circuit that controls any other circuit through a relay or an equivalent device.

Sealable Equipment. Equipment enclosed in a case or cabinet that is provided with a means of sealing or locking so that live parts cannot be made accessible without opening the enclosure. The equipment may or may not be operable without opening the enclosure.

Separately Derived System. A premises wiring system whose power is derived from generator, transformer, or converter winding and has no direct electrical connection, including a solidly connected grounded circuit conductor, to supply conductors originating in another system.

Service. The conductors and equipment for delivering energy from the electricity supply system to the wiring system of the premises served.

Service Cable. Service conductors made up in the form of a cable.

Service Conductors. The supply conductors that extend from the street main or from transformers to the service equipment of the premises supplied.

Service Drop. The overhead service conductors from the last pole or other aerial support to and including the splices, if any, connecting to the service-entrance conductors at the building or other structure.

Service-Entrance Cable. Service-entrance cable is a single conductor or multiconductor assembly provided with or without an overall covering, primarily used for services and of the following types:

> Type SE, having a flame-retardant, moisture-resistant covering, but not required to have inherent protection against mechanical abuse.
>
> Type USE, recognized for underground use, having a moisture-resistant covering, but not required to have a flame-retardant covering or inherent protection against mechanical abuse. Single-conductor cables having an insulation specifically approved for the purpose do not require an outer covering.

Service-Entrance Conductors, Overhead System. The service conductors between the terminals of the service equipment and a point usually outside the building, clear of building walls, where joined by tap or splice to the service drop.

Service-Entrance Conductors, Underground System. The service conductors between the terminals of the service equipment and the point of connection to the service lateral. Where service equipment is located outside the building walls, there may be no service-entrance conductors, or they may be entirely outside the building.

Service Equipment. The necessary equipment, usually consisting of a circuit breaker or switch and fuses, and their accessories, located near the point of entrance of supply conductors to a building or other structure, or an otherwise defined area, and intended to constitute the main control and means of cutoff of the supply.

Service Raceway. The raceway that encloses the service-entrance conductors.

Shielded Nonmetallic-Sheathed Cable. Type SNM, shielded nonmetallic-sheathed cable is a factory assembly of two or more insulated conductors in an extruded core of moisture-resistant, flame-resistant nonmetallic material, covered with an overlapping spiral metal tape and wire shield and jacketed with an extruded moisture-, flame-, oil-, corrosion-, fungus-, and sunlight-resistant nonmetallic material.

Show Window. Any window used or designed to be used for the display of goods or advertising material, whether it is fully or partly enclosed or entirely open at the rear and whether or not it has a platform raised higher than the street floor level.

Sign. See "Electric Sign."

Signaling Circuit. Any electric circuit that energizes signaling equipment.

Special Permission. The written consent of the authority having jurisdiction.

Storable Swimming or Wading Pools. A pool with a maximum dimension of 15 feet and a maximum wall height of 3 feet and is so constructed that it may be readily disassembled for storage and reassembled to its original integrity.

Switchboard. A large single panel, frame, or assembly of panels which have switches, buses, instruments, overcurrent and other protective devices mounted on the face or back or both. Switchboards are generally accessible from the rear as well as from the front and are not intended to be installed in cabinets. (See "Panelboard.")

Switches.

> **General-Use Switch.** A switch intended for general distribution and branch circuits. It is rated in amperes, and it is capable of interrupting its rated current at its rated voltage.
>
> **General-Use Snap Switch.** A form of general-use switch so constructed that it can be installed in flush device boxes or on outlet box covers, or otherwise used in conjunction with wiring systems recognized by this Subpart.
>
> **Isolating Switch.** A switch intended for isolating an electric circuit from the source of power. It has no interrupting rating, and it is intended to be operated only after the circuit has been opened by some other means.
>
> **Motor-Circuit Switch.** A switch, rated in horsepower, capable of interrupting the maximum operating overload current of a motor of the same horsepower rating as the switch at the rated voltage.

Switching Devices. (Over 600 Volts, Nominal.) Devices designed to close and/or open one or more electric circuits. Included in this category are circuit breakers, cutouts, disconnecting (or isolating) switches, disconnecting means, interrupter switches, and oil (filled) cutouts.

Transportable X-Ray. X-ray equipment installed in a vehicle or that may readily be disassembled for transport in a vehicle.

Utilization Equipment. Utilization equipment means equipment which utilizes electric energy for mechanical, chemical, heating, lighting, or similar useful purpose.

Utilization System. A utilization system is a system which provides electric power and light for employee workplaces, and includes the premises wiring system and utilization equipment.

Ventilated. Provided with a means to permit circulation of air sufficient to remove an excess of heat, fumes, or vapors.

Volatile Flammable Liquid. A flammable liquid having a flash point below 38°C (100°F) or whose temperature is above its flash point.

Voltage (of a Circuit). The greatest root-mean-square (effective) difference potential between any two conductors of the circuit concerned.

Voltage, Nominal. A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 120/240, 480Y/277, 600, etc.). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of equipment.

Voltage to Ground. For grounded circuits, the voltage between the given conductor and that point or conductor of the circuit that is grounded; for ungrounded circuits, the greatest voltage between the given conductor and any other conductor of the circuit.

Watertight. So constructed that moisture will not enter the enclosure.

Weatherproof. So constructed or protected that exposure to the weather will not interfere with successful operation. Rainproof, raintight, or watertight equipment can fulfill the requirements for weatherproof where varying weather conditions other than wetness, such as snow, ice, dust, or temperature extremes, are not a factor.

Wet Location. See "Location"

Wireways. Wireways are sheet metal troughs with hinged or removable covers for housing and protecting electric wires and cable and in which conductors are laid in place after the wireway has been installed as a complete system.

YES NO

This final standard became effective April 16, 1981. It revises Subpart S of 29 CFR Part 1910, and is intended to simplify and update the former standard.

1910.301 — INTRODUCTION

General.

This subpart addresses electrical safety requirements that are necessary for the practical safeguarding of employees in their work places.

1910.302 — ELECTRIC UTILIZATION SYSTEMS

Sections 1910.302 through 1910.308 contain design safety standards for electric utilization systems.

(a) Scope.

Covered (a)(1)

The provisions of 1910.302 through 1910.308 of this subpart cover electrical installations and utilization equipment installed or used within or on buildings, structures, and other premises including:

- (i) Yards;
- (ii) Carnivals;
- (iii) Parking and other lots;
- (iv) Mobile homes;
- (v) Recreational vehicles;
- (vi) Industrial substations;
- (vii) Conductors that connect the installations to a supply of electricity; and
- (viii) Other outside conductors on the premises. (a)(1)

(b) Extent of Application.

The requirements contained in the sections listed below shall apply to all electrical installations and utilization equipment, regardless of when they were designed or installed:

1910.303(b)	Examination, installation, and use of equipment.
1910.303(c)	Splices.
1910.303(d)	Arcing parts.
1910.303(e)	Marking.
1910.303(f)	Identification of disconnecting means.
1910.303(g)(2)	Guarding of live parts.
1910.304(e)(1)(i)	Protection of conductors and equipment.
1910.304(e)(1)(iv)	Location in or on premises.
1910.304(e)(1)(v)	Arcing or suddenly moving parts.

YES NO

1910.302 – ELECTRIC UTILIZATION SYSTEMS
(b) Extent of Application

1910.304(f)(1)(ii)	2-Wire DC systems to be grounded.
1910.304(f)(1)(iii) and 1910.304(f)(1)(iv)	AC Systems to be grounded.
1910.304(f)(1)(v)	AC systems 50 to 1000 volts not required to be grounded.
1910.304(f)(3)	Grounding connections.
1910.304(f)(4)	Grounding path.
1910.304(f)(5)(iv)(a) through 1910.304(f)(5)(iv)(d)	Fixed equipment required to be grounded.
1910.304(f)(5)(v)	Grounding of equipment connected by cord and plug.
1910.304(f)(5)(vi)	Grounding of nonelectrical equipment.
1910.304(f)(6)(i)	Methods of grounding fixed equipment.
1910.305(g)(1)(i) and 1910.305(g)(1)(ii)	Flexible cords and cables, uses.
1910.305(g)(1)(iii)	Flexible cords and cables prohibited.
1910.305(g)(2)(ii)	Flexible cords and cables, splices.
1910.305(g)(2)(iii)	Pull at joints and terminals of flexible cords and cables.
1910.307	Hazardous (classified) location

(b)(1)

Does every electric utilization system and all utilization equipment installed after March 15, 1972, and every major replacement, modification, repair, or rehabilitation, after March 15, 1972, of any part of any electric utilization system or utilization equipment installed before March 15, 1972, comply with the provisions of 1910.302 through 1910.308?

NOTE: "Major replacements, modifications, repairs, or rehabilitations" include work similar to that involved when a new building or facility is built, a new wing is added, or an entire floor is renovated. (b)(2)

The following provisions apply to electric utilization systems and utilization equipment installed after April 16, 1981:

1910.303(h)(4)(i) and (ii)	Entrance and access to workspace (over 600 volts).
1910.304(e)(1)(vi)(b)	Circuit breakers operated vertically.
1910.304(e)(1)(vi)(c)	Circuit breakers used as switches.
1910.304(f)(7)(ii)	Grounding of systems of 1000 volts or more supplying portable or mobile equipment.

	YES	NO
1910.305(j)(6)(ii)(b) . . . . Switching series capacitors over 600 volts. 1910.306(c)(2) . . . . Warning signs for elevators and escalators. 1910.306(i) . . . . Electrically controlled irrigation machines. 1910.306(j)(5) . . . . Ground-fault circuit interrupters for fountains. 1910.308(a)(1)(ii) . . . . . Physical protection of conductors over 600 volts. 1910.308(c)(2) . . . . Marking of Class 2 and Class 3 power supplies. 1910.308(d) . . . . Fire protective signaling circuits. (b)(3)		
(a) Approval. Are the conductors and equipment required or permitted by this subpart approved? (a)		
(b) Examination, Installation, and use of Equipment. *Examination.* (b)(1) Is electrical equipment free from recognized hazards that are likely to cause death or serious physical harm to employees? (b)(1)		
Is safety of equipment determined using the following considerations: Is suitability for installing and use in conformity with the provisions of this subpart? (b)(1)(i)		
Is suitability of equipment for an identified purpose evidenced by listing or labeling for that identified purpose? (b)(1)(i)		
Is mechanical strength and durability, including, for parts designed to enclose and protect other equipment, adequate? (b)(1)(ii)		
Is electrical insulation adequate? (b)(1)(iii)		
What are the heating effects under conditions of use? (b)(1)(iv)		
What are the arcing effects? (b)(1)(v)		
Is classification by type, size, voltage, current capacity and specific use made? (b)(1)(vi)		
Have other factors which contribute to the practical safeguarding of employees using or likely to come in contact with the equipment been considered? (b)(1)(vii)		
Installation and Use. (b)(2) Is listed or labeled equipment used or installed in accordance with any instructions included in the listing or labeling? (b)(2)		
(c) Splices. Are conductors spliced or joined with splicing devices suitable for the use or by brazing, welding, or soldering with a fusible metal or alloy? (c)		

	YES	NO
Are soldered splices first so spliced or joined as to be mechanically and electrically secure without solder and then soldered? (c)		
Are all splices and joints and the free ends of conductors covered with an insulation equivalent to that of the conductors or with an insulating device suitable for the purpose? (c)		
(d) Arcing Parts. Are parts of electric equipment which in ordinary operation produce arcs, sparks, flames, or molten metal enclosed or separated and isolated from all combustible material? (d)		
(e) Marking. Does electrical equipment have the manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product may be identified placed on the equipment? (e)		
Are other markings provided giving voltage, current, wattage, and other ratings as necessary? (e)		
Is the marking of sufficient durability to withstand the environment involved? (e)		
(f) Identification of Disconnecting Means and Circuits. Is each disconnecting means required by this subpart for motors and appliances legibly marked to indicate its purpose, unless located and arranged so the purpose is evident? (f)		
Is each service, feeder, and branch circuit, at its disconnecting means or overcurrent device, legibly marked to indicate its purpose, unless located and arranged so the purpose is evident? (f)		
Are these markings of sufficient durability to withstand the environment involved? (f)		
(g) 600 Volts, Nominal, or Less. *Working Space about Electric Equipment.* (g)(1) Is sufficient access and working space provided and maintained about all electric equipment to permit ready and safe operation and maintenance of such equipment? (g)(1)		
Working Clearances. (g)(1)(i) Except as required or permitted elsewhere in this subpart, is the dimension of the working space in the direction of access to live parts operating at 600 volts or less and likely to require examination, adjustment, servicing, or maintenance while alive not less than indicated in Table S-1? (g)(1)(i)		
In addition to the dimensions shown in Table S-1, is work space not less than 30 inches wide in front of the electric equipment? (g)(1)(i)		
Are distances measured from the live parts if they are exposed, or from the enclosure front or opening if the live parts are enclosed? (g)(1)(i)		

YES NO

NOTE: Concrete, brick, or tile walls are considered to be grounded. Working space is not required in back of assemblies such as dead-front switchboards or motor control centers where there are no renewable or adjustable parts such as fuses or switches on the back, and where all connections are accessible from locations other than the back. (g)(1)(i)

Table S-1
Working Clearances

Nominal voltage to ground	Minimum clear distance for condition[2] (ft)		
	(a)	(b)	(c)
0-150	[1]3	[1]3	3
151-600	[1]3	3½	4

[1]Minimum clear distances may be 2 feet 6 inches for installations built prior to April 16, 1981.

[2]Conditions (a), (b), and (c) are as follows:

(a) Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating material. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.

(b) Exposed live parts on one side and grounded parts on the other side.

(c) Exposed live parts on both sides of the work space (not guarded as provided in Condition (a)) with the operator between. (g)(1)(i)

Clear Spaces. (g)(1)(ii)

Is working space required by this subpart not used for storage? (g)(1)(ii)

When normally enclosed live parts are exposed for inspection or servicing, is the working space, if in a passageway or general open space, suitably guarded? (g)(1)(ii)

Access and Entrance to Working Space. (g)(1)(iii)

Is at least one entrance of sufficient area provided to give access to the working space about electric equipment? (g)(1)(iii)

Front Working Space. (g)(1)(iv)

Where there are live parts normally exposed on the front of switchboards or motor control centers, is the working space in front of such equipment not less than 3 feet? (g)(1)(iv)

Illumination. (g)(1)(v)

Is illumination provided for all working spaces about service equipment, switchboards, panelboards, and motor control centers installed indoors? (g)(1)(v)

Headroom. (g)(1)(vi)

Is the minimum headroom of working spaces about service equipment, switchboards, panelboards, or motor control centers 6 feet 3 inches? (g)(1)(vi)

YES NO

NOTE: As used in this section a motor control center is an assembly of one or more enclosed sections having a common power bus and principally containing motor control units. (g)(1)(vi)

Guarding of Live Parts. (g)(2)

Except as required or permitted elsewhere in this subpart, are live parts of electric equipment operating at 50 volts or more guarded against accidental contact by approved cabinets or other forms of approved enclosures, or by any of the following means: (g)(2)(i)

(a) By location in a room, vault, or similar enclosure that is accessible only to qualified persons? (g)(2)(i)(a)

(b) By suitable permanent, substantial partitions or screens so arranged that only qualified persons will have access to the space within reach of the live parts? (g)(2)(i)(b)

Are any openings in such partitions or screens so sized and located that persons are not likely to come into accidental contact with the live parts or to bring conducting objects into contact with them? (g)(2)(i)(b)

(c) By location on a suitable balcony, gallery, or platform so elevated and arranged as to exclude unqualified persons? (g)(2)(i)(c)

(d) By elevation of 8 feet or more above the floor or other working surface? (g)(2)(i)(d)

In locations where electric equipment would be exposed to physical damage, are enclosures or guards so arranged and of such strength as to prevent such damage? (g)(2)(ii)

Are entrances to rooms and other guarded locations containing exposed live parts marked with conspicuous warning signs forbidding unqualified persons to enter? (g)(2)(iii)

(h) Over 600 Volts, Nominal.

General. (h)(1)

Do conductors and equipment used on circuits exceeding 600 volts, nominal, comply with all applicable provisions of paragraphs (a) through (g) of this section and with the following provisions which supplement or modify those requirements? (h)(1)

NOTE: The provisions of paragraphs (h)(2), (h)(3), and (h)(4) of this section do not apply to equipment on the supply side of the service conductors. (h)(1)

Enclosure for Electrical Installations. (h)(2)

Electrical installations in a vault, room, closet or in an area surrounded by a wall, screen, or fence, access to which is controlled by lock and key or other approved means, are considered to be accessible to qualified persons only.

A wall, screen, or fence less than 8 feet in height is not considered to prevent access unless it has other features that provide a degree of isolation equivalent to an 8 foot fence. (h)(2)

1910.303 – GENERAL REQUIREMENTS
(h) Over 600 Volts, Nominal

	YES	NO
Are the entrances to all buildings, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 volts, nominal, kept locked or under the observation of a qualified person at all times? **(h)(2)**		
Installations Accessible to Qualified Persons Only. **(h)(2)(i)**		
Are electrical installations having exposed live parts accessible to qualified persons only? **(h)(2)(i)**		
Do electrical installations having exposed live parts comply with the applicable provisions of paragraph (h)(3) of this section? **(h)(2)(i)**		
Installations Accessible to Unqualified Persons. **(h)(2)(ii)**		
Are electrical installations that are open to unqualified persons made with metal-enclosed equipment or enclosed in a vault or in an area, access to which is controlled by a lock? **(h)(2)(ii)**		
If metal-enclosed equipment is installed so that the bottom of the enclosure is less than 8 feet above the floor, is the door or cover kept locked? **(h)(2)(ii)**		
Are metal-enclosed switchgear, unit substations, transformers, pull boxes, connection boxes, and other similar associated equipment marked with appropriate caution signs? **(h)(2)(ii)**		
If equipment is exposed to physical damage from vehicular traffic, are suitable guards provided to prevent such damage? **(h)(2)(ii)**		
Are ventilating or similar openings in metal-enclosed equipment designed so that foreign objects inserted through these openings will be deflected from energized parts? **(h)(2)(ii)**		
Work Space about Equipment. **(h)(3)**		
Is sufficient space provided and maintained about electric equipment to permit ready and safe operation and maintenance of such equipment? **(h)(3)**		
Where energized parts are exposed, is the minimum clear work space not less than 6 feet 6 inches high (measured vertically from the floor or platform), or not less than 3 feet wide (measured parallel to the equipment)? **(h)(3)**		
Is the depth as required in Table S-2? **(h)(3)**		
Is the work space adequate to permit at least a 90-degree opening of doors or hinged panels? **(h)(3)**		
Working Space. **(h)(3)(i)**		
Is the minimum clear working space in front of electric equipment such as switchboards, control panels, switches, circuit breakers, motor controllers, relays, and similar equipment not less than specified in Table S-2 unless otherwise specified in this subpart? **(h)(3)(i)**		
Are distances measured from the live parts if they are exposed, or from the enclosure front or opening if the live parts are enclosed? **(h)(3)(i)**		
Working space is not required in back of equipment such as deadfront switchboards or control assemblies where there are no renewable or adjustable parts (such as fuses or switches) on the back and where all locations are accessible from locations other than the back. **(h)(3)(i)**		

1910.303 – GENERAL REQUIREMENTS
(h) Over 600 Volts, Nominal

	YES	NO
Where rear access is required to work on de-energized parts on the back of enclosed equipment, is a minimum working space of 30 inches horizontally provided? **(h)(3)(i)**		

Table S-2
Minimum Depth of Clear Working Space in Front of Electric Equipment

	Conditions[2] (ft)		
Nominal voltage to ground	(a)	(b)	(c)
601 to 2,500	3	4	5
2,501 to 9,000	4	5	6
9,001 to 25,000	5	6	9
25,001 to 75kV[1]	6	8	10
Above 75kV[1]	8	10	12

[1] Minimum depth of clear working space in front of electric equipment with a nominal voltage to ground above 25,000 volts may be the same as for 25,000 volts under Conditions (a), (b), and (c) for installations built prior to April 16, 1981.

[2] Conditions (a), (b), and (c) are as follows:

(a) Exposed live parts on one side and no live or grounded parts on the other side of the working space, or exposed live parts on both sides effectively guarded by suitable wood or other insulating materials. Insulated wire or insulated busbars operating at not over 300 volts are not considered live parts.

(b) Exposed live parts on one side and grounded parts on the other side. Concrete, brick, or tile walls will be considered as grounded surfaces.

(c) Exposed live parts on both sides of the work space not guarded as provided in condition (a) with the operator between. **(h)(3)(i)**

	YES	NO
Illumination. **(h)(3)(ii)**		
Is adequate illumination provided for all working spaces about electric equipment? **(h)(3)(ii)**		
Are lighting outlets so arranged that persons changing lamps or making repairs on the lighting system will not be endangered by live parts or other equipment? **(h)(3)(ii)**		
Are the points of control so located that persons are not likely to come in contact with any live part or moving part of the equipment while turning on the lights? **(h)(3)(ii)**		
Elevation of Unguarded Live Parts. **(h)(3)(iii)**		
Are unguarded live parts above working space maintained at elevations not less than specified in Table S-3? **(h)(3)(iii)**		

Table S-3
Elevation of Unguarded Energized Parts Above Working Space

Nominal voltage between phases	Minimum elevation
601 to 7,500	*8 feet 6 inches.
7,501 to 35,000	9 feet
Over 35kV	9 feet + 0.37 inches per kV above 35kV.

***NOTE** — Minimum elevation may be 8 feet 0 inches for installations built prior to April 16, 1981 if the nominal voltage between phases is in the range of 601-6600 volts. **(h)(3)(iii)**

Entrance and Access to Work Space. **(h)(4)**
(see 1910.302(b)(3).)

Is at least one entrance not less than 24 inches wide and 6 feet 6 inches high provided to give access to the working space about electric equipment? **(h)(4)(i)**

On switchboard and control panels exceeding 48 inches in width, is there one entrance at each end of such board where practicable? **(h)(4)(i)**

Where bare energized parts at any voltage or insulated energized parts above 600 volts are located adjacent to such entrance, are they suitably guarded? **(h)(4)(i)**

Are permanent ladders or stairways provided to give safe access to the working space around electric equipment installed on platforms, balconies, mezzanine floors, or in attic or roof rooms or spaces? **(h)(4)(ii)**

(a) Use and Identification of Grounded and Grounding Conductors.

Identification of Conductors. **(a)(1)**

Is a conductor used as a grounded conductor identifiable and distinguishable from all other conductors? **(a)(1)**

Is a conductor used as an equipment grounding conductor identifiable and distinguishable from all other conductors? **(a)(1)**

Polarity of Connections. **(a)(2)**

Is no grounded conductor attached to any terminal or lead so as to reverse designated polarity? **(a)(2)**

Use of Grounding Terminals and Devices. **(a)(3)**

Is a grounding terminal or grounding-type device on a receptacle, cord connector, or attachment plug not used for purposes other than grounding? **(a)(3)**

Removed and reserved for future use. **(b)(1)**

Outlet Devices. **(b)(2)**

Do outlet devices have an ampere rating not less than the load to be served? **(b)(2)**

(c) Outside Conductors, 600 Volts, Nominal, or Less.

Paragraphs (c)(1), (c)(2), (c)(3), and (c)(4) of this section apply to branch circuit, feeder, and service conductors rated 600 volts, nominal, or less and run outdoors as open conductors. Paragraph (c)(5) applies to lamps installed under such conductors. **(c)**

Conductors on Poles. **(c)(1)**

Do conductors supported on poles provide a horizontal climbing space not less than the following:

Power conductors below communication conductors —30 inches? **(c)(1)(i)**

Power conductors alone or above communication conductors: 300 volts or less — 24 inches; more than 300 volts — 30 inches? **(c)(1)(ii)**

Communication conductors below power conductors with power conductors 300 volts or less — 24 inches; more than 300 volts — 30 inches? **(c)(1)(iii)**

Clearance from Ground. **(c)(2)**

Do open conductors conform to the following minimum clearances:

10 feet — above finished grade, sidewalks, or from any platform or projection from which they might be reached? **(c)(2)(i)**

12 feet — over areas subject to vehicular traffic other than truck traffic? **(c)(2)(ii)**

15 feet — over areas other than those specified in paragraph (c)(2)(iv) of this section that are subject to truck traffic? **(c)(2)(iii)**

18 feet — over public streets, alleys, roads, and driveways? **(c)(2)(iv)**

Clearance from Building Openings. **(c)(3)**

Do conductors have a clearance of at least 3 feet from windows, doors, porches, fire escapes, or similar locations? **(c)(3)**

Conductors that run above the top level of a window are considered to be out of reach from that window and, therefore, do not have to be 3 feet away. **(c)(3)**

Clearance Over Roofs. **(c)(4)**

Do conductors have a clearance of not less than 8 feet from the highest point of roofs over which they pass, except that:

Where the voltage between conductors is 300 volts or less and the roof has a slope of not less than 4 inches in 12, is the clearance from roofs at least 3 feet? **(c)(4)(i)**

Where the voltage between conductors is 300 volts or less and the conductors do not pass over more than 4 feet of the overhang portion of the roof and they are terminated at a through-the-roof raceway or approved support, is the clearance from roofs at least 18 inches? **(c)(4)(ii)**

YES NO

Location of Outdoor Lamps. (c)(5)

Are lamps for outdoor lighting located below all live conductors, transformers, or other electric equipment, unless such equipment is controlled by a disconnecting means that can be locked in the open position or unless adequate clearances or other safeguards are provided for relamping operations? (c)(5)

(d) Services.

Disconnecting Means. (d)(1)

General. (d)(1)(i)

Are means provided to disconnect all conductors in a building or other structure from the service-entrance conductors? (d)(1)(i)

Does the disconnecting means plainly indicate whether it is in the open or closed position? (d)(1)(i)

Is the disconnecting means installed at a readily accessible location nearest the point of entrance of the service-entrance conductors? (d)(1)(i)

Simultaneous Opening of Poles. (d)(1)(ii)

Does each service disconnecting means simultaneously disconnect all ungrounded conductors? (d)(1)(ii)

Services Over 600 Volts, Nominal. (d)(2)

Guarding. (d)(2)(i)

Are service-entrance conductors installed as open wires guarded to make them accessible only to qualified persons? (d)(2)(i)

Warning Signs. (d)(2)(ii)

Are signs warning of high voltage posted where other than qualified employees might come in contact with live parts? (d)(2)(ii)

(e) Overcurrent Protection.

600 Volts, Nominal, or Less. (e)(1)

Protection of Conductors and Equipment. (e)(1)(i)

Are conductors and equipment protected from overcurrent in accordance with their ability to safely conduct current? (e)(1)(i)

Grounded Conductors. (e)(1)(ii)

Except for motor running overload protection, do overcurrent devices not interrupt the continuity of the grounded conductor unless all conductors of the circuit are opened simultaneously? (e)(1)(ii)

Disconnection of Fuses and Thermal Cutouts. (e)(1)(iii)

Except for service fuses, are all cartridge fuses which are accessible to other than qualified persons and all fuses and thermal cutouts on circuits over 150 volts to ground provided with disconnecting means? (e)(1)(iii)

Is this disconnecting means installed so that the fuse or thermal cutout can be disconnected from its supply without disrupting service to equipment and circuits unrelated to those protected by the overcurrent devise? (e)(1)(iii)

YES NO

Location In or On Premises. (e)(1)(iv)

Are overcurrent devices readily accessible to each employee or authorized building management personnel? (e)(1)(iv)

Are these overcurrent devices not located where they will be exposed to physical damage nor in the vicinity of easily ignitible material? (e)(1)(iv)

Arcing or Suddenly Moving Parts. (e)(1)(v)

Are fuses and circuit breakers so located or shielded that employees will not be burned or otherwise injured by their operation? (e)(1)(v)

Circuit Breakers. (e)(1)(vi)

Do circuit breakers clearly indicate whether they are in the open (off) or closed (on) position? (e)(1)(vi)(a)

Where circuit breaker handles on switchboards are operated vertically rather than horizontally or rotationally, is the up position of the handle the closed (on) position? (See 1910.302(b)(3).) (e)(1)(vi)(b)

If used as switches in 120-volt, fluorescent lighting circuits, are breakers approved for the purpose and marked "SWD"? (See 1910.302(b)(3).) (e)(1)(vi)(c)

Over 600 Volts, Nominal. (e)(2)

Do feeders and branch circuits over 600 volts, nominal, have short-circuit protection? (e)(2)

(f) Grounding.

Systems to be Grounded. (f)(1)

Are the following systems which supply premises wiring grounded:

Do all 3-wire DC systems have their neutral conductor grounded? (f)(1)(i)

Are two-wire DC systems operating at over 50 volts through 300 volts between conductors grounded unless:

(a) They supply only industrial equipment in limited areas and are equipped with a ground detector? (f)(1)(ii)(a)

(b) They are rectifier-derived from an AC system complying with paragraphs (f)(1)(iii), (f)(1)(iv), and (f)(1)(v) of this section? (f)(1)(ii)(b)

(c) They are fire-protective signaling circuits having a maximum current of 0.030 amperes? (f)(1)(ii)(c)

Are AC circuits of less than 50 volts grounded if they are installed as overhead conductors outside of buildings, or if they are supplied by transformers and the transformer primary supply system is ungrounded or exceeds 150 volts to ground? (f)(1)(iii)

Are AC systems of 50 volts to 1000 volts grounded under any of the following conditions, unless exempted by paragraph (f)(1)(v) of this section:

(a) Can the system be so grounded that the maximum voltage to ground on the ungrounded conductors does not exceed 150 volts? (f)(1)(iv)(a)

(b) Is the system nominally rated 480Y/277 volt, 3-phase, 4-wire in which the neutral is used as a circuit conductor? **(f)(1)(iv)(b)**

(c) Is the system nominally rated 240/120 volt, 3-phase, 4-wire in which the midpoint of one phase is used as a circuit conductor? **(f)(1)(iv)(c)**

(d) Is a service conductor uninsulated? **(f)(1)(iv)(d)**

AC systems of 50 volts to 1000 volts are not required to be grounded under any of the following conditions:

(a) Is the system used exclusively to supply industrial electric furnaces for melting, refining, tempering, and the like? **(f)(1)(v)(a)**

(b) Is the system separately derived and used exclusively for rectifiers supplying only adjustable speed industrial drives? **(f)(1)(v)(b)**

(c) Is the system separately derived and supplied by a transformer that has a primary voltage rating less than 1000 volts? **(f)(1)(v)(c)**

Are all of the following conditions met:

(1) Is the system used exclusively for control circuits? **(f)(1)(v)(c)(1)**

(2) Do the conditions of maintenance and supervision assure that only qualified persons will service the installation? **(f)(1)(v)(c)(2)**

(3) Is continuity of control power required? **(f)(1)(v)(c)(3)**

(4) Are ground detectors installed on the control system? **(f)(1)(v)(c)(4)**

(d) Is the system an isolated power system that supplies circuits in health care facilities? **(f)(1)(v)(d)**

Conductors to be Grounded. **(f)(2)**

For AC premises wiring systems, is the identified conductor grounded? **(f)(2)**

Grounding Connections. **(f)(3)**

For a grounded system, is a grounding electrode conductor used to connect both the equipment grounding conductor and the grounded circuit conductor to the grounding electrode? **(f)(3)(i)**

Are both the equipment grounding conductor and the grounding electrode conductor connected to the grounded circuit conductor on the supply side of the service disconnecting means, or on the supply side of the system disconnecting means or overcurrent device if the system is separately derived? **(f)(3)(i)**

For an ungrounded service-supplied system, is the equipment grounding conductor connected to the grounding electrode conductor at the service equipment? **(f)(3)(ii)**

For an ungrounded separately derived system, is the equipment grounding conductor connected to the grounding electrode conductor at, or ahead of, the system disconnecting means or overcurrent devices? **(f)(3)(ii)**

On extensions of existing branch circuits which do not have an equipment grounding conductor, grounding-type receptacles may be grounded to a grounded cold water pipe near the equipment. **(f)(3)(iii)**

Grounding Path. **(f)(4)**

Is the path to ground from circuits, equipment, and enclosures permanent and continuous? **(f)(4)**

Supports, Enclosures, and Equipment to be Grounded. **(f)(5)**

Supports and Enclosures for Conductors. **(f)(5)(i)**

Are metal cable trays, metal raceways, and metal enclosures for conductors grounded, except that:

(a) Metal enclosures such as sleeves that are used to protect cable assemblies from physical damage need not be grounded. **(f)(5)(i)(a)**

(b) Metal enclosures for conductors added to existing installations of open wire, knob-and-tube wiring, and nonmetallic-sheathed cable need not be grounded if all the following conditions are met:

(1) Are runs less than 25 feet? **(f)(5)(i)(b)(1)**

(2) Are enclosures free from probable contact with ground, grounded metal, metal laths, or other conductive materials? **(f)(5)(i)(b)(2)**

(3) Are enclosures guarded against employee contact? **(f)(5)(i)(b)(3)**

Service Equipment Enclosures. **(f)(5)(ii)**

Are metal enclosures for service equipment grounded? **(f)(5)(ii)**

Frames of Ranges and Clothes Dryers. **(f)(5)(iii)**

Are frames of electric ranges, wall-mounted ovens, counter-mounted cooking units, clothes dryers, and metal outlet or junction boxes which are part of the circuit for these appliances grounded? **(f)(5)(iii)**

Fixed Equipment. **(f)(5)(iv)**

Are exposed noncurrent-carrying metal parts of fixed equipment which may become energized grounded under any of the following conditions:

(a) Are they within 8 feet vertically or 5 feet horizontally of ground or grounded metal objects and subject to employee contact? **(f)(5)(iv)(a)**

(b) Are they located in a wet or damp location and not isolated? **(f)(5)(iv)(b)**

(c) Are they in electrical contact with metal? **(f)(5)(iv)(c)**

(d) Are they in a hazardous (classified) location? **(f)(5)(iv)(d)**

(e) Are they supplied by a metal-clad, metal-sheathed, or grounded metal raceway wiring method? **(f)(5)(iv)(e)**

(f) Does equipment operate with any terminal at over 150 volts to ground? **(f)(5)(iv)(f)**

The following need not be grounded:

(1) Enclosures for switches or circuit breakers used for other than service equipment and accessible to qualified persons only; **(f)(5)(iv)(f)(1)**

(2) Metal frames of electrically heated appliances which are permanently and effectively insulated from ground; **(f)(5)(iv)(f)(2)**

	YES	NO
(3) The cases of distribution apparatus such as transformers and capacitors mounted on wooden poles at a height exceeding 8 feet above ground or grade level. **(f)(5)(iv)(f)(3)**		
Equipment Connected by Cord and Plug. **(f)(5)(v)** Under any of the conditions described in paragraphs (f)(5)(v)(a) through (f)(5)(v)(c) of this section, are exposed noncurrent-carrying metal parts of cord- and plug-connected equipment, which may become energized, grounded? **(f)(5)(v)**		
Are they in hazardous (classified) locations? (See 1910.306) **(f)(5)(v)(a)**		
Are they operated at over 150 volts to ground, except for guarded motors and metal frames of electrically heated appliances if the appliance frames are permanently and effectively insulated from ground? **(f)(5)(v)(b)**		
Is the equipment of the following types: **(f)(5)(v)(c)**		
(1) Refrigerators, freezers, and air conditioners? **(f)(5)(v)(c)(1)**		
(2) Clothes-washing, clothes-drying and dishwashing machines, sump pumps, and electrical aquarium equipment? **(f)(5)(v)(c)(2)**		
(3) Hand-held motor-operated tools? **(f)(5)(v)(c)(3)**		
(4) Motor-operated appliances of the following types: hedge clippers, lawn mowers, snow blowers, and wet scrubbers? **(f)(5)(v)(c)(4)**		
(5) Cord- and plug-connected appliances used in damp or wet locations or by employees standing on the ground or on metal floors or working inside of metal tanks or boilers? **(f)(5)(v)(c)(5)**		
(6) Portable and mobile x-ray and associated equipment? **(f)(5)(v)(c)(6)**		
(7) Tools likely to be used in wet and conductive locations? **(f)(5)(v)(c)(7)**		
(8) Portable hand lamps? **(f)(5)(v)(c)(8)**		
Are tools likely to be used in wet and conductive locations supplied through an isolating transformer with an ungrounded secondary of not over 50 volts? **(f)(5)(v)(c)**		
If listed or labeled portable tools and appliances protected by an approved system of double insulation or its equivalent is employed, is equipment distinctively marked to indicate that the tool or appliance utilizes an approved system of double insulation? **(f)(5)(v)(c)**		
Nonelectrical Equipment. **(f)(5)(vi)** Are the metal parts of the following nonelectrical equipment grounded:		
Frames and tracks of electrically operated cranes? **(f)(5)(vi)**		
Frames of nonelectrically driven elevator cars to which electric conductors are attached? **(f)(5)(vi)**		
Hand operated metal shifting ropes or cables of electric elevators? **(f)(5)(vi)**		
Metal partitions, grill work, and similar metal enclosures around equipment of over 750 volts between conductors? **(f)(5)(vi)**		

	YES	NO
Methods of Grounding Fixed Equipment. **(f)(6)** Are noncurrent-carrying metal parts of fixed equipment, if required to be grounded by this subpart, grounded by an equipment grounding conductor which is contained within the same raceway, cable, or cord, or runs with or encloses the circuit conductors? **(f)(6)(i)**		
Is the equipment grounding conductor run separately from the circuit conductors for DC circuits only? **(f)(6)(i)**		
Is electric equipment effectively grounded by securing it to, and in electrical contact with, a metal rack or structure that is provided for its support and the metal rack or structure is grounded by the method specified for the noncurrent-carrying metal parts of fixed equipment in paragraph (f)(6)(i) of this section? **(f)(6)(ii)**		
For installations made before April 16, 1981, only, is electric equipment effectively grounded by securing it to, and in metallic contact with, the grounded structural metal frame of a building? **(f)(6)(ii)**		
Grounding of Systems and Circuits of 1000 Volts and Over (High Voltage). **(f)(7)** *General.* **(f)(7)(i)** If high voltage systems are grounded, do they comply with all applicable provisions of paragraphs (f)(1) through (f)(6) of this section as supplemented and modified by this paragraph (f)(7)? **(f)(7)(i)**		
Grounding of Systems Supplying Portable or Mobile Equipment. (See 1910.302(b)(3).) **(f)(7)(ii)** Do systems supplying portable or mobile high voltage equipment, other than substations installed on a temporary basis, comply with the following:		
Is portable and mobile high voltage equipment supplied from a system having its neutral grounded through an impedance? **(f)(7)(ii)(a)**		
Is a system neutral derived by using a delta-connected high voltage system to supply the equipment? **(f)(7)(ii)(a)**		
Are exposed noncurrent-carrying metal parts of portable and mobile equipment connected by an equipment grounding conductor to the point at which the system neutral impedance is grounded? **(f)(7)(ii)(b)**		
Is ground-fault detection and relaying provided to automatically de-energize any high voltage system component which has developed a ground fault? **(f)(7)(ii)(c)**		
Is the continuity of the equipment grounding conductor continuously monitored so as to de-energize automatically the high voltage feeder to the portable equipment upon loss of continuity of the equipment grounding conductor? **(f)(7)(ii)(c)**		
Is the grounding electrode to which the portable or mobile equipment system neutral impedance is connected isolated from, and separated in, the ground by at least 20 feet from any other system or equipment grounding electrode? **(f)(7)(ii)(d)**		
Is there no direct connection between the grounding electrodes, such as buried pipe, fence, etc? **(f)(7)(ii)(d)**		

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YES NO

Grounding of Equipment. (f)(7)(iii)

Are all noncurrent-carrying metal parts of portable equipment and fixed equipment including their associated fences, housings, enclosures, and supporting structures grounded? (f)(7)(iii)

Is ungrounded equipment guarded by location and isolated from ground? (f)(7)(iii)

Is ungrounded pole-mounted distribution apparatus at a height exceeding 8 feet above ground or grade level? (f)(7)(iii)

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(a) Wiring Methods.

The provisions of this section do not apply to the conductors that are an integral part of factory-assembled equipment.

General Requirements. (a)(1)

Electrical Continuity of Metal Raceways and Enclosures. (a)(1)(i)

Are metal raceways, cable armor, and other metal enclosures for conductors metallically joined together into a continuous electric conductor? (a)(1)(i)

Are they so connected to all boxes, fittings, and cabinets as to provide effective electrical continuity? (a)(1)(i)

Wiring in Ducts. (a)(1)(ii)

Are no wiring systems of any type installed in ducts used to transport dust, loose stock, or flammable vapors? (a)(1)(ii)

Is no wiring system of any type installed in any duct used for vapor removal or for ventilation of commercial-type cooking equipment, or in any shaft containing only such ducts? (a)(1)(ii)

Temporary Wiring. (a)(2)

Except as specifically modified in this paragraph, all other requirements of this subpart for permanent wiring shall apply to temporary wiring installations.

Uses Permitted, 600 Volts, Nominal, or Less. (a)(2)(i)

Are temporary electrical power and lighting installations 600 volts, nominal, or less used only:

During and for remodeling, maintenance, repair, or demolition of buildings, structures, or equipment, and similar activities? (a)(2)(i)(a)

For experimental or development work? (a)(2)(i)(b)

For a period not to exceed 90 days for Christmas decorative lighting, carnivals, and similar purposes? (a)(2)(i)(c)

Uses Permitted, Over 600 Volts, Nominal. (a)(2)(ii)

Is temporary wiring over 600 volts, nominal, used only during periods of tests, experiments, or emergencies? (a)(2)(ii)

General Requirements for Temporary Wiring. (a)(2)(iii)

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YES NO

Do feeders originate in an approval distribution center? (a)(2)(iii)(a)

Are conductors run as multi-conductor cord cable assemblies? (a)(2)(iii)(a)

Where not subject to physical damage, are they run as open conductors on insulators not more than 10 feet apart? (a)(2)(iii)(a)

Do branch circuits originate in an approved power outlet or panelboard? (a)(2)(iii)(b)

Are conductors multi-conductor cord, or cable assemblies, or open conductors? (a)(2)(iii)(b)

If run as open conductors, are they fastened at ceiling height every 10 feet? (a)(2)(iii)(b)

Is no branch-circuit conductor laid on the floor? (a)(2)(iii)(b)

Does each branch circuit that supplies receptacles or fixed equipment contain a separate equipment grounding conductor if run as open conductors? (a)(2)(iii)(b)

Are receptacles of the grounding type? (a)(2)(iii)(c)

Unless installed in a complete metallic raceway, does each branch circuit contain a separate equipment grounding conductor? (a)(2)(iii)(c)

Are all receptacles electrically connected to the grounding conductor? (a)(2)(iii)(c)

Are no bare conductors nor earth returns used for the wiring of any temporary circuit? (a)(2)(iii)(d)

Are suitable disconnecting switches or plug connectors installed to permit the disconnection of all ungrounded conductors of each temporary circuit? (a)(2)(iii)(e)

Are lamps for general illumination protected from accidental contact or breakage? (a)(2)(iii)(f)

Is protection provided by elevation of at least 7 feet from normal working surface or by a suitable fixture of lampholder with a guard? (a)(2)(iii)(f)

Are flexible cords and cables protected from accidental damage? (a)(2)(iii)(g)

Are sharp corners and projections avoided? (a)(2)(iii)(g)

Where passing through doorways or other pinch points, are flexible cords and cables provided with protection to avoid damage? (a)(2)(iii)(g)

Cable Trays. (a)(3)

Uses Permitted. (a)(3)(i)

Are only the following installed in cable tray systems:

Mineral-insulated metal sheathed cable (Type MI)? (a)(3)(i)(a)(1)

Armored cable (Type AC)? (a)(3)(i)(a)(2)

Metal-clad cable (Type MC)? (a)(3)(i)(a)(3)

Power limited tray cable (Type PLTC)? (a)(3)(i)(a)(4)

Nonmetallic-sheathed cable (Type NM or NMC)? (a)(3)(i)(a)(5)

Shielded nonmetallic-sheathed cable (Type SNM)? (a)(3)(i)(a)(6)

YES NO

Multi-conductor service-entrance cable (Type SE or USE)? (a)(3)(i)(a)(7)

Multi-conductor underground feeder and branch-circuit cable (Type UF)? (a)(3)(i)(a)(8)

Power and control tray cable (Type TC)? (a)(3)(i)(a)(9)

Other factory-assembled, multi-conductor control, signal, or power cables which are specifically approved for installation in cable trays? (a)(3)(i)(a)(10)

Any approved conduit or raceway with its contained conductors? (a)(3)(i)(a)(11)

In industrial establishments only, where conditions of maintenance and supervision assure that only qualified persons will service the installed cable tray system, are the following cables installed in ladder, ventilated trough, or 4 inch ventilated channel-type cable trays? (a)(3)(i)(b)

Single conductor cables which are 250 MCM or larger and are Types RHH, RHW, MV, USE, or THW, and 250 MCM or larger single conductor cables if specifically approved for installation in cable trays? (a)(3)(i)(b)(1)

Where exposed to direct rays of the sun, are cables sunlight-resistant? (a)(3)(i)(b)(1)

Are type MV cables, where exposed to direct rays of the sun, sunlight-resistant? (a)(3)(i)(b)(2)

Do cable trays in hazardous (classified) locations contain only the cable types permitted in such locations? (a)(3)(i)(c)

Uses Not Permitted. (a)(3)(ii)

Are cable tray systems not used in hoistways, or where subjected to severe physical damage? (a)(3)(ii)

Open Wiring on Insulators. (a)(4)

Uses Permitted. (a)(4)(i)

For industrial or agricultural establishments and for services, is open wiring on insulators only on systems of 600 volts, nominal, or less? (a)(4)(i)

Conductor Supports. (a)(4)(ii)

Are conductors rigidly supported on noncombustible, nonabsorbent insulating materials? (a)(4)(ii)

Do conductors not contact any other objects? (a)(4)(ii)

Flexible Nonmetallic Tubing. (a)(4)(iii)

Where conductors are separately enclosed in flexible nonmetallic tubing, are they in dry locations and not exposed to severe physical damage? (a)(4)(iii)

Is the tubing in continuous lengths not exceeding 15 feet and secured to the surface by straps at intervals not exceeding 4 feet 6 inches? (a)(4)(iii)

Through Walls, Floors, Wood Cross Members, etc. (a)(4)(iv)

Are open conductors separated from contact with walls, floors, wood cross members, or partitions through which they pass by tubes or bushings of noncombustible, nonabsorbent insulating material? (a)(4)(iv)

YES NO

If the bushing is shorter than the hole, is a waterproof sleeve of nonconductive material inserted in the hole and an insulating bushing slipped into the sleeve at each end in such a manner as to keep the conductors absolutely out of contact with the sleeve? (a)(4)(iv)

Is each conductor carried through a separate tube or sleeve? (a)(4)(iv)

Protection from Physical Damage. (a)(4)(v)

Conductors within 7 feet from the floor are considered exposed to physical damage.

Where open conductors cross ceiling joints and wall studs and are exposed to physical damage, are they protected? (a)(4)(v)

(b) Cabinets, Boxes, and Fittings.

Conductors Entering Boxes, Cabinets, or Fittings. (b)(1)

Are conductors entering boxes, cabinets, or fittings protected from abrasion? (b)(1)

Are openings through which conductors enter effectively closed? (b)(1)

Are unused openings in cabinets, boxes, and fittings effectively closed? (b)(1)

Covers and Canopies. (b)(2)

Are all pull boxes, junction boxes, and fittings provided with covers approved for the purpose? (b)(2)

If metal covers are used, are they grounded? (b)(2)

In completed installations, does each outlet box have a cover faceplate, or fixture canopy? (b)(2)

Are covers of outlet boxes having holes through which flexible cord pendants pass provided with bushings designed for the purpose or have smooth, well-rounded surfaces on which the cords may bear? (b)(2)

Pull and Junction Boxes for Systems Over 600 Volts, Nominal. (b)(3)

In addition to other requirements in this section for pull and juction boxes, does the following apply to these boxes for systems over 600 volts, nominal:

Do boxes provide a complete enclosure for the contained conductors or cables? (b)(3)(i)

Are boxes closed by suitable covers securely fastened in place? (b)(3)(ii)

Underground box covers that weigh over 100 pounds meet this requirement. (b)(3)(ii)

Are covers for boxes permanently marked "HIGH VOLTAGE"? (b)(3)(ii)

Is the marking on the outside of the box cover readily visible and legible? (b)(3)(ii)

(c) Switches.

Knife Switches. (c)(1)

Are single-throw knife switches so connected that the blades are dead when the switch is in the open position? (c)(1)

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		YES	NO
Are single-throw knife switches so placed that gravity will not tend to close them?	(c)(1)		
Are single-throw knife switches approved for use in the inverted position provided with a locking device that will ensure that the blades remain in the open position when so set?	(c)(1)		
With double-throw knife switches, if the throw is verticle, is a locking device provided to ensure that the blades remain in the open position when so set?	(c)(1)		
Faceplates for Flush-Mounted Snap Switches.	(c)(2)		
Are flush snap switches that are mounted in ungrounded metal boxes and located within reach of conducting floors or other conducting surfaces provided with faceplates of nonconducting, noncombustible material?	(c)(2)		
(d) Switchboards and Panelboards.			
Are switchboards that have any exposed live parts located in permanently dry locations?	(d)		
Are they accessible only to qualified persons?	(d)		
Are panelboards mounted in cabinets, cutout boxes, or enclosures approved for the purpose and dead front?	(d)		
Are panelboards other than the dead front externally-operable type accessible only to qualified persons?	(d)		
Are exposed blades of knife switches dead when open?	(d)		
(e) Enclosures for Damp or Wet Locations.			
Are cabinets, cutout boxes, fittings, boxes, and panelboard enclosures in damp or wet locations installed so as to prevent moisture or water from entering and accumulating within the enclosures?	(e)(1)		
In wet locations, are the enclosures weatherproof?	(e)(1)		
Are switches, circuit breakers, and switchboards installed in wet locations enclosed in weatherproof enclosures?	(e)(2)		
(f) Conductors for General Wiring.			
Are all conductors used for general wiring insulated unless otherwise permitted in this subpart?	(f)		
Is the conductor insulation of a type that is approved for the voltage, operating temperature, and location of use?	(f)		
Are insulated conductors distinguishable by appropriate color or other suitable means as being grounded conductors, ungrounded conductors, or equipment grounding conductors?	(f)		
(g) Flexible Cords and Cables.			
Use of Flexible Cords and Cables.	(g)(1)		
Are flexible cords and cables approved and suitable for conditions of use and location?	(g)(1)(i)		
Are flexible cords and cables used only for:			
Pendants?	(g)(1)(i)(a)		
Wiring of fixtures?	(g)(1)(i)(b)		
Connection of portable lamps or appliances?	(g)(1)(i)(c)		
Elevator cables?	(g)(1)(i)(d)		

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		YES	NO
Wiring of cranes and hoists?	(g)(1)(i)(e)		
Connection of stationary equipment to facilitate their frequent interchange?	(g)(1)(i)(f)		
Prevention of the transmission of noise or vibration?	(g)(1)(i)(g)		
Appliances where the fastening means and mechanical connections are designed to permit removal for maintenance and repair?	(g)(1)(i)(h)		
Data processing cables approved as a part of the data processing system?	(g)(1)(i)(i)		
If used as permitted in paragraphs (g)(1)(i)(c), (g)(1)(i)(f), or (g)(1)(i)(h) of this section, is the flexible cord equiped with an attachment plug and energized from an approved receptacle outlet?	(g)(1)(ii)		
Unless specifically permitted in paragraphs (g)(1)(i) of this section, are flexible cords and cables not used:			
As a substitute for the fixed wiring of a structure?	(g)(1)(iii)(a)		
Where run through holes in walls, ceilings, or floors?	(g)(1)(iii)(b)		
Where run through doorways, windows, or similar openings?	(g)(1)(iii)(c)		
Where attached to building surfaces?	(g)(1)(iii)(d)		
Where concealed behind building walls, ceilings, or floors?	(g)(1)(iii)(e)		
Are flexible cords used to show windows and showcases of Type S, SO, SJ, ST, STO, SJT, SJTO, or AFS?	(g)(1)(iv)		
Identification, Splices, and Terminations.	(g)(2)		
Is a conductor of a flexible cord or cable that is used as a grounded conductor or an equipment grounding conductor distinguishable from other conductors?	(g)(2)(i)		
Are Types SJ, SJO, SJT, SJTO, S, SO, ST, and STO durably marked on the surface with the type designation, size, and number of conductors?	(g)(2)(i)		
Are flexible cords used only in continuous lengths without splice or tap?	(g)(2)(ii)		
If hard service flexible cords No. 12 or larger are repaired, are they spliced so that the splice retains the insulation, outer sheath properties, and usage characteristics of the cord being spliced?	(g)(2)(ii)		
Are flexible cords connected to devices and fittings so that strain relief is provided which will prevent pull from being directly transmitted to joints or terminal screws?	(g)(2)(iii)		
(h) Portable Cables Over 600 Volts, Nominal.			
Does multi-conductor portable cable for use in supplying power to portable or mobile equipment at over 600 volts, nominal, consist of No. 8 or larger conductors employing flexible stranding?	(h)		
Are cables operated at over 2000 volts shielded for the purpose of confining the voltage stresses to the insulation?	(h)		
Are grounding conductors provided?	(h)		

	YES	NO
Are connectors for these cables of a locking type with provisions to prevent their opening or closing while energized? (h)		
Is strain relief provided at connections and terminations? (h)		
Are portable cables not operated with splices unless the splices are of the permanent molded, vulcanized, or other approved type? (h)		
Are termination enclosures suitably marked with a high voltage hazard warning? (h)		
Are terminations accessible only to authorized and qualified personnel? (h)		
(i) Fixture Wires.		
General. (i)(1)		
Are fixture wires approved for the voltage, temperature, and location of use? (i)(1)		
Is a fixture wire which is used as a grounded conductor identified? (i)(1)		
Uses Permitted. (i)(2)		
Are fixture wires used:		
For installation in lighting fixtures and in similar equipment where enclosed or protected and not subject to bending or twisting in use? (i)(2)(i)		
For connecting lighting fixtures to the branch-circuit conductors supplying the fixtures? (i)(2)(ii)		
Uses Not Permitted. (i)(3)		
Are fixture wires not used as branch-circuit conductors except as permitted for Class 1 power limited circuits? (i)(3)		
(j) Equipment for General Use.		
Lighting Fixtures, Lampholders, Lamps, and Receptacles. (j)(1)		
Do fixtures, lampholders, lamps, rosettes, and receptacles have no live parts normally exposed to employee contact? (j)(1)(i)		
Are rosettes and cleat-type lampholders and receptacles that have exposed parts, located at least 8 feet above the floor? (j)(1)(i)		
Are handlamps of the portable type supplied through flexible cords equipped with a handle of molded composition or other material approved for the purpose? (j)(1)(ii)		
Is a substantial guard attached to the lampholder or the handle? (j)(1)(ii)		
Are lampholders of the screw-shell type installed for use as lampholders only? (j)(1)(iii)		
Are lampholders installed in wet or damp locations of the weatherproof type? (j)(1)(iii)		
Are fixtures installed in wet or damp locations approved for the purpose? (j)(1)(iv)		

	YES	NO
Are they so constructed or installed that water cannot enter or accumulate in wireways, lampholders, or other electrical parts? (j)(1)(iv)		
Receptacles, Cord Connections, and Attachment Plugs (Caps). (j)(2)		
Are receptacles, cord connectors, and attachment plugs constructed so that no receptacle or cord connector will accept an attachment plug with a different voltage or current rating than that for which the device is intended? (j)(2)(i)		
However, a 20-ampere T-slot receptacle or cord connector may accept a 15-ampere attachment plug of the same voltage rating. (j)(2)(i)		
Is a receptacle installed in a wet or damp location suitable for the location? (j)(2)(ii)		
Appliances. (j)(3)		
Do appliances, other than those in which the current-carrying parts at high temperatures are necessarily exposed, have no live parts normally exposed to employee contact? (j)(3)(i)		
Is a means provided to disconnect each appliance? (j)(3)(ii)		
Is each appliance marked with its rating in volts and amperes or volts and watts? (j)(3)(iii)		
Motors. (j)(4)		
This paragraph applies to motors, motor circuits, and controllers.		
In Sight From. (j)(4)(i)		
If specified that one piece of equipment shall be "in sight from" another piece of equipment, is one visible and not more than 50 feet from the other? (j)(4)(i)		
Disconnecting Means. (j)(4)(ii)		
Is a disconnecting means located in sight from the controller location? (j)(4)(ii)(a)		
If the controller disconnecting means for motor branch circuits over 600 volts, nominal, is out of sight of the controller, is the controller marked with a warning label giving the location and identification of the disconnecting means which is to be locked in the open position? (j)(4)(ii)(a)		
Does the disconnecting means disconnect the motor and the controller from all ungrounded supply conductors? (j)(4)(ii)(b)		
Is it so designed that no pole can be operated independently? (j)(4)(ii)(b)		
If a motor and the driven machinery are not in sight from the controller location, does the installation comply with one of the following conditions:		
Is the controller disconnecting means capable of being locked in the open position? (j)(4)(ii)(c)(1)		

Is a manually operable switch that will disconnect the motor from its source of supply placed in sight from the motor location? (j)(4)(ii)(c)(2)

Does the disconnecting means plainly indicate whether it is in the open(off) or closed(on) position? (j)(4)(ii)(d)

Is the disconnecting means readily accessible? (j)(4)(ii)(e)

NOTE: If more than one disconnect is provided for the same equipment, only one need be readily accessible. (j)(4)(ii)(e)

Is an individual disconnecting means provided for each motor? (j)(4)(ii)(f)

A single disconnecting means may be used for a group of motors under any one of the following conditions:

Do a number of motors drive special parts of a single machine or piece of apparatus, such as metal and woodworking machines, cranes, and hoists? (j)(4)(ii)(f)(1)

Is a group of motors under the protection of one set of branch-circuit protective devices? (j)(4)(ii)(f)(2)

Is a group of motors in a single room in sight from the location of the disconnecting means? (j)(4)(ii)(f)(3)

Motor Overload, Short-Circuit, and Ground-Fault Protection. (j)(4)(iii)

Are motors, motor-control apparatus, and motor branch-circuit conductors protected against overheating due to motor overloads or failure to start, and against short-circuits or ground-faults? (j)(4)(iii)

These provisions shall not require overload protection that will stop a motor where a shutdown is likely to introduce additional or increased hazards, as in the case of fire pumps, or where continued operation of a motor is necessary for a safe shutdown of equipment or process and motor overload sensing devices are connected to a supervised alarm. (j)(4)(iii)

Protection of Live Parts — All Voltages. (j)(4)(iv)

Are exposed live parts of motors and controllers operating at 50 volts or more between terminals guarded against accidental contact by any of the following:

Are they installed in a room or enclosure that is accessible only to qualified persons? (j)(4)(iv)(a)(1)

Is installation on a suitable balcony, gallery, or platform, so elevated and arranged as to exclude unqualified persons? (j)(4)(iv)(a)(2)

Is elevation 8 feet or more above the floor? (j)(4)(iv)(a)(3)

Where live parts of motors or controllers operating at over 150 volts to ground are guarded against accidental contact only by location, and where adjustment or other attendance may be necessary during the operation of the apparatus, are suitable insulating mats or platforms provided so that the attendant cannot readily touch live parts unless standing on the mats or platforms? (j)(4)(iv)(b)

Transformers. (j)(5)

The following paragraphs cover the installation of all transformers except the following:

Current transformers; (j)(5)(i)(a)

Dry-type transformers installed as a component part of other apparatus; (j)(5)(i)(b)

Transformers which are an integral part of an x-ray, high frequency, or electrostatic-coating apparatus; (j)(5)(i)(c)

Transformers used with Class 2 and Class 3 circuits, sign and outline lighting, electric discharge lighting, and power-limited fire-protective signalling circuits; (j)(5)(i)(d)

Liquid-filled or dry-type transformers used for research, development, or testing, where effective safeguard arrangements are provided. (j)(5)(i)(e)

Is the operating voltage of exposed live parts of transformer installations indicated by warning signs or visible markings on the equipment or structure? (j)(5)(ii)

Are dry-type, high fire point liquid-insulated, and askarel-insulated transformers installed indoors and rated over 35kV in a vault? (j)(5)(iii)

If they present a fire hazard to employees, are oil-insulated transformers installed indoors in a vault? (j)(5)(iv)

Are combustible material, combustible buildings and parts of buildings, fire escapes, and door and window openings safeguarded from fires which may originate in oil-insulated transformers attached to or adjacent to a building or combustible material? (j)(5)(v)

Are transformer vaults constructed so as to contain fire and combustible liquids within the vault and to prevent unauthorized access? (j)(5)(vi)

Are locks and latches so arranged that a vault door can be readily opened from the inside? (j)(5)(vi)

Does any pipe or duct system foreign to the vault installation not enter or pass through a transformer vault? (j)(5)(vii)

Are materials not stored in transformer vaults? (j)(5)(viii)

Capacitors. (j)(6)

Are all capacitors included as a component part of other apparatus, provided with an automatic means of draining the stored charge after the capacitor is disconnected from its source of supply? (j)(6)(i)

Do capacitors rated over 600 volts, nominal, comply with the following additional requirements:

Are isolating or disconnecting switches (with no interrupting rating) interlocked with the load interrupting device or provided with prominently displayed caution signs to prevent switching load current? (j)(6)(ii)(a)

For series capacitors (see 1910.302(b)(3)), is the proper switching assured by use of at least one of the following:

Mechanically sequenced isolating and bypass switches? (j)(6)(ii)(b)(1)

Interlocks? (j)(6)(ii)(b)(2)

Switching procedure prominently displayed at the switching location? (j)(6)(ii)(b)(3)

Storage Batteries. (j)(7)

Are provisions made for sufficient diffusion and ventilation of gases from storage batteries to prevent the accumulation of explosive mixtures? (j)(7)

1910.306 — SPECIFIC PURPOSE EQUIPMENT AND INSTALLATIONS

YES NO

(a) Electric Signs and Outline Lighting.

Disconnecting Means. (a)(1)

Do signs operated by electronic or electromechanical controllers located outside the sign have a disconnecting means located inside the controller enclosure or within sight of the controller location? (a)(1)

Is it capable of being locked in the open position? (a)(1)

Does such disconnecting means have no pole that can be operated independently? (a)(1)

Does it open all ungrounded conductors that supply the controller and sign? (a)(1)

Do all other signs, except the portable type, and all outline lighting installations have an externally operable disconnecting means which can open all underground conductors and is within the sight of the sign or outline lighting it controls? (a)(1)

Are doors or covers giving access to uninsulated parts of indoor signs or outline lighting exceeding 600 volts and accessible to other than qualified persons either provided with interlock switches to disconnect the primary circuit or so fastened that the use of other than ordinary tools will be necessary to open them? (a)(2)

(b) Cranes and Hoists.

This paragraph applies to the installation of electric equipment and wiring used in connection with cranes, monorail hoists, hoists, and all runways.

Disconnecting Means. (b)(1)

Is a readily accessible disconnecting means provided between the runway contact conductors and the power supply? (b)(1)(i)

Is another disconnecting means, capable of being locked in the open position, provided in the leads from the runway contact conductors or other power supply on any crane or monorail hoist? (b)(1)(ii)

If this additional disconnecting means is not readily accessible from the crane or monorail hoist operating station, are means provided at the operating station to open the power circuit to all motors of the crane or monorail hoist? (b)(1)(ii)(a)

The additional disconnect may be omitted if a monorail hoist or hand-propelled crane bridge installation meets all of the following:

Is the unit floor controlled? (b)(1)(ii)(b)(1)

Is the unit within view of the power supply disconnecting means? (b)(1)(ii)(b)(2)

Has no fixed work platform been provided for servicing the unit? (b)(1)(ii)(b)(3)

Control. (b)(2)

Is a limit switch or other device provided to prevent the load block from passing the safe upper limit of travel of any hoisting mechanism? (b)(2)

1910.306 — SPECIFIC PURPOSE EQUIPMENT AND INSTALLATIONS

YES NO

Clearance. (b)(3)

Is the dimension of the working space in the direction of access to live parts which may require examination, adjustment, servicing, or maintenance while alive a minimum of 2 feet 6 inches? (b)(3)

Where controls are enclosed in cabinets, do the door(s) either open at least 90 degrees, or are they removable? (b)(3)

(c) Elevators, Dumbwaiters, Escalators, and Moving Walks.

Disconnecting Means. (c)(1)

Do elevators, dumbwaiters, escalators, and moving walks have a single means for disconnecting all underground main power supply conductors for each unit? (c)(1)

Warning Signs. (c)(2)

If interconnections between control panels are necessary for operation of the system on a multicar installation that remains energized from a source other than the disconnecting means, is a warning sign mounted on or adjacent to the disconnecting means? (c)(2)

Is the sign clearly legible? (c)(2)

Does the sign read "Warning — Parts of the control panel are not de-energized by this switch"? (See 1910.302(b)(3).) (c)(2)

Control Panels. (c)(3)

If control panels are not located in the same space as the drive machine, are they located in cabinets with doors or panels capable of being locked closed? (c)(3)

(d) Electric Welders — Disconnecting Means.

Is a disconnecting means provided in the supply circuit for each motor-generator arc welder, and for each AC transformer and DC rectifier arc welder which is not equipped with a disconnect mounted as an integral part of the welder? (d)(1)

Is a switch or circuit breaker provided by which each resistance welder and its control equipment can be isolated from the supply circuit? (d)(2)

Is the ampere rating of this disconnecting means not less than the supply conductor ampacity? (d)(2)

(e) Data Processing Systems — Disconnecting Means.

Is a disconnecting means provided to disconnect the power to all electronic equipment in data processing or computer rooms? (e)

Is this disconnecting means controlled from locations readily accessible to the operator at the principal exit doors? (e)

Is there also a similar disconnecting means to disconnect the air conditioning system serving this area? (e)

(f) X-Ray Equipment.

This paragraph applies to x-ray equipment for other than medical or dental use.

1910.306 — SPECIFIC PURPOSE EQUIPMENT AND INSTALLATIONS	YES	NO
Disconnecting Means. (f)(1)		
Is a disconnecting means provided in the supply circuit? (f)(1)(i)		
Is the disconnecting means operable from a location readily accessible from the x-ray control? (f)(1)(i)		
For equipment connected to a 120-volt branch circuit of 30 amperes or less, does a grounding-type attachment plug cap and receptacle of proper rating serve as a disconnecting means? (f)(1)(i)		
If more than one piece of equipment is operated from the same high-voltage circuit, is each piece or each group of equipment as a unit provided with a high-voltage switch or equivalent disconnecting means? (f)(1)(ii)		
Is this disconnecting means constructed, enclosed, or located so as to avoid contact by employees with its live parts? (f)(1)(ii)		
Control. (f)(2)		
Radiographic and Fluoroscopic Types. (f)(2)(i)		
Is radiographic and fluoroscopic-type equipment effectively enclosed, or does it have interlocks that de-energize the equipment automatically to prevent ready access to live current-carrying parts? (f)(2)(i)		
Diffraction and Irradiation Types. (f)(2)(ii)		
Is diffraction and irradiation-type equipment provided with a means to indicate when it is energized unless the equipment or installation is effectively enclosed or is provided with interlocks to prevent access to live current-carrying parts during operation? (f)(2)(ii)		
(g) Induction and Dielectric Heating Equipment.		
Scope. (g)(1)		
Paragraphs (g)(2) and (g)(3) of this section cover induction and dielectric heating equipment and accessories for industrial and scientific applications, but not for medical or dental applications or for appliances. (g)(1)		
Guarding and Grounding. (g)(2)		
Enclosures. (g)(2)(i)		
Are the converting apparatus (including the DC line) and high-frequency electric circuits (excluding the output circuits and remote-control circuits) completely contained within enclosures or noncombustible material? (g)(2)(i)		
Panel Controls. (g)(2)(ii)		
Are all panel controls of dead-front construction? (g)(2)(ii)		
Access to Internal Equipment. (g)(2)(iii)		
Where doors are used for access to voltages from 500 to 1000 volts AC or DC, are either door locks or interlocks provided? (g)(2)(iii)		
Where doors are used for access to voltages of over 1000 volts AC or DC, are either mechanical lockouts with a disconnecting means to prevent access until voltage is removed from the cubicle, or both door interlocking and mechanical door locks provided? (g)(2)(iii)		
Warning Labels. (g)(2)(iv)		
Are "Danger" labels attached on the equipment? (g)(2)(iv)		

1910.306 — SPECIFIC PURPOSE EQUIPMENT AND INSTALLATIONS	YES	NO
Are the labels plainly visible even when doors are open or panels are removed from compartments containing voltages of over 250 volts AC or DC? (g)(2)(iv)		
Work Applicator Shielding. (g)(2)(v)		
Are protective cages or adequate shielding used to guard work applicators other than induction heating coils? (g)(2)(v)		
Are induction heating coils protected by insulation and/or refractory materials? (g)(2)(v)		
Are interlock switches used on all hinged access doors, sliding panels, or other such means of access to the applicator? (g)(2)(v)		
Are interlock switches connected in such a manner as to remove all power from the applicator when any one of the access doors or panels is open? (g)(2)(v)		
Interlocks on access doors or panels are not required if the applicator is an induction heating coil at DC ground potential or operating at less than 150 volts AC. (g)(2)(v)		
Disconnecting Means. (g)(2)(vi)		
Is a readily accessible disconnecting means provided by which each unit of heating equipment can be isolated from its supply circuit? (g)(2)(vi)		
Remote Control. (g)(3)		
If remote controls are used for applying power, is a selector switch provided and interlocked to provide power from only one control point at a time? (g)(3)		
Are switches operated by foot pressure provided with a shield over the contract button to avoid accidental closing of the switch? (g)(3)		
(h) Electrolytic Cells.		
Scope. (h)(1)		
These provisions for electrolytic cells apply to the installation of the electrical components and accessory equipment or electrolytic cells, electrolytic cell lines, and process power supply for the production of aluminum, cadmium, chlorine, copper, fluorine, hydrogen peroxide, magnesium, sodium, sodium chlorate, and zinc. Cells used as a source of electric energy and for electroplating processes and cells used for production of hydrogen are not covered by these provisions. (h)(1)		
Definitions Applicable to this Paragraph. (h)(2)		
"Cell line": An assembly of electrically interconnected electrolytic cells supplied by a source of direct-current power. (h)(2)		
"Cell line attachments and auxiliary equipment": Cell line attachments and auxiliary equipment include, but are not limited to: auxiliary tanks; process piping; duct work; structural supports; exposed cell line conductors; conduits and other raceways; pumps; positioning equipment and cell cutout or bypass electrical devices. Auxiliary equipment also includes tools, welding machines, crucibles, and other portable equipment used for operation and maintenance within the electrolytic cell line working zone. In the cell line working zone, auxiliary equipment includes the exposed conductive surfaces of ungrounded cranes and crane-mounted cell-servicing equipment. (h)(2)		

1910.306 — SPECIFIC PURPOSE EQUIPMENT AND INSTALLATIONS	YES	NO
"Cell line working zone": The cell line working zone is the space envelope wherein operation or maintenance is normally performed on or in the vicinity of exposed energized surfaces of cell lines or their attachments. **(h)(2)**		
"Electrolytic Cells": A receptacle or vessel in which electrochemical reactions are caused by applying energy for the purpose of refining or producing usable materials. **(h)(2)**		
Application. **(h)(3)**		
Do installations covered by paragraph (h) of this section comply with all applicable provisions of this subpart except as follows:		
Overcurrent protection of electrolytic cell DC process power circuits need not comply with the requirements of 1910.304(e). **(h)(3)(i)**		
Equipment located or used within the cell line working associated with the cell line DC power circuits need not comply with the provisions of 1910.304(f). **(h)(3)(ii)**		
Electrolytic cells, cell line conductors, cell line attachments, and the wiring of auxiliary equipment and devices within the cell line working zone need not comply with the provisions of 1910.303 and 1910.304(b)and(c). **(h)(3)(iii)**		
Disconnecting Means. **(h)(4)**		
If more than one DC cell line process power supply serves the same cell line, is a disconnecting means provided on the cell line circuit side of each power supply to disconnect it from the cell line circuit? **(h)(4)(i)**		
Are removable links or removable conductors used as the disconnecting means? **(h)(4)(ii)**		
Portable Electric Equipment. **(h)(5)**		
Are the frames and enclosures of portable electric equipment used within the cell line working zone not grounded? **(h)(5)(i)**		
If these frames and enclosures are grounded, does the cell line circuit voltage not exceed 200 volts DC or are the frames guarded? **(h)(5)(i)**		
Is ungrounded portable electric equipment distinctively marked and not interchangeable with grounded portable electric equipment? **(h)(5)(ii)**		
Power Supply Circuits and Receptacles for Portable Electric Equipment. **(h)(6)**		
Are circuits supplying power to ungrounded receptacles for hand-held, cord- and plug-connected equipment electrically isolated from any distribution system supplying areas other than the cell line working zone and ungrounded? **(h)(6)(i)**		
Is power for these circuits supplied through isolating transformers? **(h)(6)(i)**		
Do receptacles and their mating plugs for ungrounded equipment not have provision for a grounding conductor? **(h)(6)(ii)**		
Are they of a configuration which prevents their use for equipment required to be grounded? **(h)(6)(ii)**		

1910.306 — SPECIFIC PURPOSE EQUIPMENT AND INSTALLATIONS	YES	NO
Do receptacles on circuits supplied by an isolating transformer with an ungrounded secondary have a distinctive configuration? **(h)(6)(iii)**		
Are they distinctively marked? **(h)(6)(iii)**		
Are they not used in any other location in the plant? **(h)(6)(iii)**		
Fixed and Portable Electric Equipment. **(h)(7)**		
AC systems supplying fixed and portable electric equipment within the cell line working zone need not be grounded. **(h)(7)(i)**		
Exposed conductive surfaces, such as electric equipment housing, cabinets, boxes, motors, raceways and the like that are within the cell line working zone need not be grounded. **(h)(7)(ii)**		
Are auxiliary electrical devices, such as motors, transducers, sensors, control devices, and alarms mounted on an electrolytic cell or other energized surface, connected by any of the following means:		
Multi-conductor hard usage or extra hard usage flexible cord? **(h)(7)(iii)(a)**		
Wire or cable in suitable raceways? **(h)(7)(iii)(b)**		
Exposed metal conduit, cable tray, armored cable, or similar metallic systems installed with insulating breaks such that they will not cause a potentially hazardous electric condition? **(h)(7)(iii)(c)**		
If fixed electric equipment is mounted on an energized conductive surface, is it bonded to that surface? **(h)(7)(iv)**		
Auxiliary Nonelectric Connections. **(h)(8)**		
Do auxiliary nonelectric connections, such as air hoses, water hoses, and the like to an electrolytic cell, its attachments, or auxiliary equipment, not have continuous conductive reinforcing wire, armor, braids, and the like? **(h)(8)**		
Are hoses of a nonconductive material? **(h)(8)**		
Cranes and Hoists. **(h)(9)**		
The conductive surfaces of cranes and hoists that enter the cell line working zone need not be grounded. **(h)(9)(i)**		
Is the portion of an overhead crane or hoist which contacts an energized electrolytic cell or energized attachments insulated from ground? **(h)(9)(i)**		
Do remote crane or hoist controls which may introduce hazardous electrical conditions into the cell line working zone employ one or more of the following systems:		
Insulated and ungrounded control circuit? **(h)(9)(ii)(a)**		
Nonconductive rope operator? **(h)(9)(ii)(b)**		
Pendant pushbutton with nonconductive supporting means and having nonconductive surfaces or ungrounded exposed conductive surfaces? **(h)(9)(ii)(c)**		
Radio? **(h)(9)(ii)(d)**		

(i) Electrically Driven or Controlled Irrigation Machines. (See 1910.302(b)(3).)

Lightning Protection. (i)(1)

If an electrically driven or controlled irrigation machine has a stationary point, is a driven ground rod connected to the machine at the stationary point for lightning protection? (i)(1)

Disconnecting Means. (i)(2)

Is the main disconnecting means for a center pivot irrigation machine located at the point of connection of electrical power to the machine? (i)(2)

Is it readily accessible and capable of being locked in the open position? (i)(2)

Is a disconnecting means provided for each motor and controller? (i)(2)

(j) Swimming Pools, Fountains, and Similar Installations.

Scope. (j)(1)

Paragraphs (j)(2) through (j)(5) of this section apply to electric wiring for, and equipment in or adjacent to, all swimming, wading, therapeutic, and decorative pools and fountains, whether permanently installed or storable, and to metallic auxiliary equipment, such as pumps, filters, and similar equipment. Therapeutic pools in health care facilities are exempt from these provisions. (j)(1)

Lighting and Receptacles. (j)(2)

Receptacles. (j)(2)(i)

Is a single receptacle of the locking and grounding type that provides power for a permanently installed swimming pool recirculating pump motor located not less than 5 feet from the inside walls of a pool? (j)(2)(i)

Are all other receptacles on the property located at least 10 feet from the inside walls of a pool? (j)(2)(i)

Are receptacles which are located within 15 feet of the inside walls of the pool protected by ground-fault circuit interrupters? (j)(2)(i)

NOTE: In determining these dimensions, the distance to be measured is the shortest path the supply cord of an appliance connected to the receptacle would follow without piercing a floor, wall, or ceiling of a building or other effective permanent barrier. (j)(2)(i)

Lighting Fixtures and Lighting Outlets. (j)(2)(ii)

Are lighting fixtures and lighting outlets installed over a pool or over the area extending 5 feet horizontally from the inside walls of a pool, 12 feet above the maximum water level? (j)(2)(ii)(a)

Is a lighting fixture or lighting outlet which has been installed before April 16, 1981, and may be located less than 5 feet measured horizontally from the inside walls of a pool, at least 5 feet above the surface of the maximum water level? (j)(2)(ii)(a)

Is the lighting fixture or lighting outlet rigidly attached to the existing structure? (j)(2)(ii)(a)

Is it protected by a ground-fault circuit interrupter installed in the branch circuit supplying the fixture? (j)(2)(ii)(a)

Unless installed 5 feet above the maximum water level and rigidly attached to the structure adjacent to or enclosing the pool, are lighting fixtures and lighting outlets installed in the area extending between 5 feet and 10 feet horizontally from the inside walls of a pool, protected by a ground-fault circuit interrupter? (j)(2)(ii)(b)

Cord- and Plug-Connected Equipment. (j)(3)

Do flexible cords used with the following equipment not exceed 3 feet in length and have a copper equipment grounding conductor with a grounding-type attachment plug? (j)(3)

Cord- and plug-connected lighting fixtures installed within 16 feet of the water surface of permanently installed pools? (j)(3)(i)

Other cord- and plug-connected, fixed or stationary equipment used with permanently installed pools? (j)(3)(ii)

Underwater Equipment. (j)(4)

Is a ground-fault circuit interrupter installed in the branch circuit supplying underwater fixtures operating at more than 15 volts? (j)(4)(i)

Is equipment installed underwater approved for the purpose? (j)(4)(i)

Are no underwater lighting fixtures installed for operation at over 150 volts between conductors? (j)(4)(ii)

Fountains. (j)(5)

Is all electric equipment operating at more than 15 volts, including power supply cords, used with fountains protected by ground-fault interrupters? (See 1910.302(b)(3).) (j)(5)

1910.307 — HAZARDOUS (CLASSIFIED) LOCATIONS

This section covers the requirements for electric equipment and wiring in locations which are classified depending on the properties of the flammable vapors, liquids or gases, or combustible dusts or fibers which may be present therein and the likelihood that a flammable or combustible concentration or quantity is present.

Hazardous (classified) locations may be found in occupancies such as, but not limited to, the following: aircraft hangers; gasoline dispensing and service stations; bulk storage plants for gasoline or other volatile flammable liquids; paint-finishing process plants; health care facilities; agricultural or other facilities where excessive combustible dusts may be present; marinas; boat yards; and petroleum and chemical processing plants.

Each room, section, or area shall be considered individually in determining its classification. These hazardous (classified) locations are assigned six designations as follows:

Class I, Division 1
Class I, Division 2

1910.307 — HAZARDOUS (CLASSIFIED) LOCATIONS

Class II, Division 1
Class II, Division 2
Class III, Division 1
Class III, Division 2

For definitions of these locations, see 1910.399(a). All applicable requirements in this subpart shall apply to hazardous (classified) locations, unless modified by provisions of this section. (a)

(b) Electrical Installations.

Are equipment, wiring methods, and installations of equipment in classified locations intrinsically safe, approved for the hazardous (classified) location, or safe for the hazardous (classified) location? (b)

Requirements for each of these options are as follows:

Intrinsically Safe. (b)(1)

Is equipment and associated wiring approved as intrinsically safe in any hazardous (classified) location for which it is approved? (b)(1)

Approved for the Hazardous (Classified) Location. (b)(2)

Is equipment approved not only for the class of location but also for the ignitible or combustible properties of the specific gas, vapor, dust, or fiber that will be present? (b)(2)(i)

NOTE. NFPA 70, the National Electrical Code, lists or defines hazardous gases, vapors, and dusts by "Groups" characterized by their ignitible or combustible properties. (b)(2)(i)

Is equipment marked to show the class, group, and operating temperature, or temperature range, based on operation in a 40°C ambient, for which it is approved? (b)(2)(ii)

Does the temperature marking not exceed the ignition temperature of the specific gas or vapor encountered? (b)(2)(ii)

The following provisions modify this marking requirement for specific equipment:

Equipment of the non-heat-producing type, such as junction boxes, conduit, and fittings, and equipment of the heat-producing type having a maximum temperature not more than 100°C (212°F), need not have a marked operating temperature or temperature range. (b)(2)(ii)(a)

Fixed lighting fixtures marked for use in Class I, Division 2 locations only, need not be marked to indicate the group. (b)(2)(ii)(b)

Fixed general-purpose equipment in Class I locations, other than lighting fixtures, which is acceptable for use in Class I, Division 2 locations need not be marked with the class, group, division, or operating temperature. (b)(2)(ii)(c)

Fixed dust-tight equipment, other than lighting fixtures, which is acceptable for use in Class II, Division 2 and Class III locations need not be marked with the class, group, division, or operating temperature. (b)(2)(ii)(d)

1910.307 — HAZARDOUS (CLASSIFIED) LOCATIONS

Safe for the Hazardous (Classified) Location. (b)(3)

Is equipment which is safe for the location of a type and design which will provide protection from the hazards arising from the combustibility and flammability of vapors, liquids, gases, dusts, or fibers? (b)(3)

NOTE: The National Electrical Code, NFPA 70, contains guidelines for determining the type and design of equipment and installations which will meet this requirement. The guidelines of this document address electric wiring, equipment, and systems installed in hazardous (classified) locations and contain specific provisions for the following: wiring methods; wiring connections; conductor insulation; flexible cords; sealing and drainage; transformers; capacitors; switches; circuit breakers; fuses; motor controllers; receptacles; attachment plugs; meters; relays; instruments; resistors; generators; motors; lighting fixtures; storage battery charging equipment; electric cranes; electric hoists and similar equipment; utilization equipment; signaling systems; alarm systems; remote control systems; local loud speaker and communication systems; ventilation piping; live parts; lightning surge protection; and grounding. Compliance with these guidelines will constitute one means, but not the only means, of compliance with this paragraph. (b)(3)

(c) Conduits.

Are all conduits threaded and made wrench-tight? (c)

Where it is impractical to make a threaded joint tight, is a bonding jumper utilized? (c)

(d) Equipment in Division 2 Locations.

Is equipment that has been approved for a Division 1 location, installed in a Division 2 location of the same class and group? (d)

If general-purpose equipment or equipment in general-purpose enclosures is installed in Division 2 locations, does the equipment not constitute a source of ignition under normal operating conditions? (d)

1910.308 — SPECIAL SYSTEMS

(a) Systems Over 600 Volts, Nominal.

Paragraphs (a)(1) through (a)(4) of this section cover the general requirements for all circuits and equipment operated over 600 volts.

Wiring Methods for Fixed Installations. (a)(1)

Are above-ground conductors installed in rigid metal conduit, in cable trays, in cablebus, in other suitable raceways, or as open runs of metal-clad cable suitable for the use and purpose? (a)(1)(i)

Are open runs of non-metallic-sheathed cable or of bare conductors or busbars installed in locations accessible only to qualified persons? (a)(1)(i)

Are metallic shielding components, such as tapes, wires, or braids for conductors grounded? (a)(1)(i)

1910.308 — SPECIAL SYSTEMS

YES NO

Are open runs of insulated wires and cables having a bare lead sheath or a braided outer covering supported in a manner designed to prevent physical damage to the braid or sheath? (a)(1)(i)

Are conductors emerging from the ground enclosed in approved raceways? (See 1910.302(b)(3).) (a)(1)(ii)

Interrupting and Isolating Devices. (a)(2)

Do circuit breakers located indoors consist of metal-enclosed or fire-resistant, cell-mounted units? (a)(2)(i)

Is open mounting of circuit breakers in locations accessible only to qualified personnel? (a)(2)(i)

Is a means of indicating the open and closed position of circuit breakers provided? (a)(2)(i)

Are fused cutouts installed in buildings or transformer vaults of a type approved for the purpose? (a)(2)(ii)

Are they readily accessible for fuse replacement? (a)(2)(ii)

Is a means provided to completely isolate equipment for inspection and repairs? (a)(2)(iii)

Are isolating means which are not designed to interrupt the load current of the circuit either interlocked with an approved circuit interrupter or provided with a sign warning against opening them under load? (a)(2)(iii)

Mobile and Portable Equipment. (a)(3)

Power Cable Connections to Mobile Machines. (a)(3)(i)

Is a metallic enclosure provided on the mobile machine for enclosing the terminals of the power cable? (a)(3)(i)

Does the enclosure include provisions for a solid connection for the ground wire(s) terminal to effectively ground the machine frame? (a)(3)(i)

Does the method of cable termination used prevent any strain or pull on the cable from stressing the electrical connections? (a)(3)(i)

Does the enclosure have provision for locking so only authorized qualified persons may open it? (a)(3)(i)

Is it marked with a sign warning of the presence of energized parts? (a)(3)(i)

Guarding Live Parts. (a)(3)(ii)

Are all energized switching and control parts enclosed in effectively grounded metal cabinets or enclosures? (a)(3)(ii)

Do circuit breakers and protective equipment have the operating means projecting through the metal cabinet or enclosure so these units can be reset without locked doors being opened? (a)(3)(ii)

Are enclosures and metal cabinets locked so that only authorized qualified persons have access? (a)(3)(ii)

Are they marked with a sign warning of the presence of energized parts? (a)(3)(ii)

Are collector ring assemblies on revolving-type machines (shovels, draglines, etc.) guarded? (a)(3)(ii)

1910.308 — SPECIAL SYSTEMS

YES NO

Tunnel Installations. (a)(4)

Application. (a)(4)(i)

The provisions of this paragraph apply to installation and use of high-voltage power distribution and utilization equipment which is portable and/or mobile, such as substations, trailers, cars, mobile shovels, draglines, hoists, drills, dredges, compressors, pumps, conveyors, and underground excavators. (a)(4)(i)

Conductors. (a)(4)(ii)

Are conductors in tunnels installed in one or more of the following:

Metal conduit or other metal raceway? (a)(4)(ii)(a)

Type MC cable? (a)(4)(ii)(b)

Other approved multi-conductor cable? (a)(4)(ii)(c)

Are conductors so located or guarded as to protect them from physical damage? (a)(4)(ii)

Does multi-conductor portable cable supply mobile equipment? (a)(4)(ii)

Is an equipment grounding conductor run with circuit conductors inside the metal raceway or inside the multi-conductor cable jacket? (a)(4)(ii)

Guarding Live Parts. (a)(4)(iii)

Are bare terminals of transformers, switches, motor controllers, and other equipment enclosed to prevent accidental contact with energized parts? (a)(4)(iii)

Are enclosures for use in tunnels drip-proof, weatherproof, or submersible as required by the environmental conditions? (a)(4)(iii)

Disconnecting Means. (a)(4)(iv)

Is a disconnecting means that simultaneously opens all ungrounded conductors installed at each transformer or motor location? (a)(4)(iv)

Grounding and Bonding. (a)(4)(v)

Are all nonenergized metal parts of electric equipment and metal raceways and cable sheaths effectively grounded and bonded to all metal pipes and rails at the portal and at intervals not exceeding 1000 feet throughout the tunnel? (a)(4)(v)

(b) Emergency Power Systems.

Scope. (b)(1)

The provisions for emergency systems apply to circuits, systems, and equipment intended to supply power for illumination and special loads, in the event of failure of the normal supply. (b)(1)

Wiring Methods. (b)(2)

Is emergency circuit wiring kept entirely independent of all other wiring and equipment? (b)(2)

Does it not enter the same raceway, cable, box, or cabinet with other wiring except either where common circuit elements suitable for the purpose are required, or for transferring power from the normal to the emergency source? (b)(2)

YES NO

Emergency Illumination. **(b)(3)**

Where emergency lighting is necessary, is the system so arranged that the failure of any individual lighting element, such as the burning out of a light bulb, cannot leave any space in total darkness? **(b)(3)**

(c) Class 1, Class 2, and Class 3 Remote Control, Signaling, and Power-Limited Circuits.

Classification. **(c)(1)**

Class 1, Class 2, or Class 3 remote control, signaling, or power-limited circuits are characterized by their usage and electrical power limitation which differentiates them from light and power circuits. These circuits are classified in accordance with their respective voltage and power limitations as summarized in paragraphs (c)(1)(i) through (c)(1)(iii) of this section. **(c)(1)**

Class 1 Circuits. **(c)(1)(i)**

A Class 1 power-limited circuit is supplied from a source having a rated output of not more than 30 volts and 1000 volt-amperes. **(c)(1)(i)(a)**

A Class 1 remote control circuit or a Class 1 signaling circuit has a voltage which does not exceed 600 volts; however, the power output of the source need not be limited. **(c)(1)(i)(b)**

Class 2 and Class 3 Circuits. **(c)(1)(ii)**

Power for Class 2 and Class 3 circuits is limited either inherently (in which no overcurrent protection is required) or by a combination of a power source and overcurrent protection. **(c)(1)(ii)(a)**

The maximum circuit voltage is 150 volts AC or DC for a Class 2 inherently limited power source, and 100 volts AC or DC for a Class 3 inherently limited power source. **(c)(1)(ii)(b)**

The maximum circuit voltage is 30 volts AC and 60 volts DC for a Class 2 power source limited by overcurrent protection, and 150 volts AC or DC for a Class 3 power source limited by overcurrent protection. **(c)(1)(ii)(c)**

The maximum circuit voltages in paragraphs (c)(1)(i) and (c)(1)(ii) of this section apply to sinusoidal AC or continuous DC power sources, and where wet contact occurrence is not likely. **(c)(1)(iii)**

Marking. **(c)(2)**

Is a Class 2 or Class 3 power supply unit durably marked where plainly visible to indicate the class of supply and its electrical rating? (See 1910.302(b)(3).) **(c)(2)**

(d) Fire Protective Signaling Systems.
(See 1910.302(b)(3).)

Classifications. **(d)(1)**

Are fire protective signaling circuits classified either as non-power limited or power limited? **(d)(1)**

Power Sources. **(d)(2)**

Are the power sources for use with fire protective signaling circuits either power limited or nonlimited as follows:

Does the power supply of non-power-limited fire protective signaling circuits have an output voltage not in excess of 600 volts? **(d)(2)(i)**

YES NO

Is the power for power-limited fire protective signaling circuits either inherently limited, in which no overcurrent protection is required, or limited by a combination of a power source and overcurrent protection? **(d)(2)(ii)**

Non-Power-Limited Conductor Location. **(d)(3)**

If non-power-limited fire protective signaling circuits and Class 1 circuits occupy the same enclosure, cable, or raceway, are all conductors insulated for maximum voltage of any conductor within the enclosure, cable, or raceway? **(d)(3)**

Are power supply and fire protective signaling circuit conductors in the same enclosure, cable, or raceway connected to the same equipment? **(d)(3)**

Power-Limited Conductor Location. **(d)(4)**

Where open conductors are installed, are power-limited fire protective signaling circuits separated at least 2 inches from conductors of any light, power, Class 1, and non-power-limited fire protective signaling circuits unless a special and equally protective method of conductor separation is employed? **(d)(4)**

Cables and conductors of two or more power-limited fire protective signaling circuits or Class 3 circuits are permitted in the same cable, enclosure, or raceway. **(d)(4)**

Conductors of one or more Class 2 circuits are permitted within the same cable, enclosure, or raceway with conductors of power-limited fire protective signaling circuits provided that the insulation of Class 2 circuit conductors in the cable, enclosure, or raceway is at least that needed for the power-limited fire protective signaling circuits. **(d)(4)**

Identification. **(d)(5)**

Are fire protective signaling circuits identified at terminal and junction locations in a manner which will prevent unintentional interference with the signaling circuit during testing and servicing? **(d)(5)**

Are power-limited fire protective signaling circuits durably marked as such where plainly visible at terminations? **(d)(5)**

(e) Communications Systems.

Scope. **(e)(1)**

These provisions for communication systems apply to such systems as central-station-connected and non-central-station-connected telephone circuits, radio and television receiving and transmitting equipment, including community antenna television and radio distribution systems, telegraph, district messenger, and outside wiring for fire and burglar alarm, and similar central station systems.

These installations need not comply with the provisions of 1910.303 through 1910.308(d) **(e)(1)**

Protective Devices. **(e)(2)**

Do communication circuits so located as to be exposed to accidental contact with light or power conductors operating at over 300 volts, have each circuit so exposed provided with a protector approved for the purpose? **(e)(2)(i)**

1910.308 — SPECIAL SYSTEMS

YES NO

Is each conductor of a lead-in from an outdoor antenna provided with an antenna discharge unit or other suitable means that will drain static charges from the antenna system? (e)(2)(ii)

Conductor Location. (e)(3)

Outside of Buildings. (e)(3)(i)

Are receiving distribution lead-in or aerial-drop cables attached to buildings and lead-in conductors to radio transmitters so installed as to avoid the possibility of accidental contact with electric light or power conductors? (e)(3)(i)(a)

Is the clearance between lead-in conductors and any lightning protection conductors not less than 6 feet? (e)(3)(i)(b)

On Poles. (e)(3)(ii)

Where practicable, are communication conductors on poles located below the light or power conductors? (e)(3)(ii)

Are communications conductors not attached to a cross-arm that carries light or power conductors? (e)(3)(ii)

Inside of Buildings. (e)(3)(iii)

Are indoor antennas, lead-ins, and other communication conductors attached as open conductors to the inside of buildings located at least 2 inches from conductors of any light or power or Class 1 circuits unless a special and equally protective method of conductor separation, approved for the purpose, is employed? (e)(3)(iii)

Equipment Location. (e)(4)

Are outdoor metal structures supporting antennas, as well as self-supporting antennas such as vertical rods or dipole structures located as far away from overhead conductors of electric light and power circuits of over 150 volts to ground as necessary to avoid the possibility of the antenna or stucture falling into or making accidental contact with such circuits? (e)(4)

Grounding. (e)(5)

Lead-In Conductors. (e)(5)(i)

If exposed to contact with electric light and power conductors, is the metal sheath of aerial cables entering buildings grounded or interrupted close to the entrance to the building by an insulating joint or equivalent device? (e)(5)(i)

Where protective devices are used, are they grounded in an approved manner? (e)(5)(i)

Antenna Structures. (e)(5)(ii)

Are masts and metal structures supporting antennas permanently and effectively grounded without splice or connection in the grounding conductor? (e)(5)(ii)

Equipment Enclosures. (e)(5)(iii)

Are transmitters enclosed in a metal frame or grill or separated from the operating space by a barrier, all metallic parts of which are effectively connected to ground?
3 (e)(5)(iii)

Are all external metal handles and controls accessible to the operating personnel effectively grounded? (e)(5)(iii)

1910.308 — SPECIAL SYSTEMS

YES NO

Unpowered equipment and enclosures shall be considered grounded where connected to an attached coaxial cable with an effectively grounded metallic shield. (e)(5)(iii)

1910.331 — SAFETY-RELATED WORK PRACTICES

[Added 1990]

Scope

Provisions of 1910.331 through 1910.335 cover electrical safety-related work practices for both qualified persons (those who have training in avoiding the electrical hazards of working on or near exposed energized parts) and unqualified persons (those with little or no such training). The rules cover employees working on, near, or with the following installations:

Premises wiring. Installations of electric conductors and equipment within or on buildings or other structures, and on other premises such as yards, parking and other lots, and industrial substations; (a)(1)

Wiring for connection to supply. Installations of other outside conductors on the premises; (a)(2)

Other wiring. Installations of conductors that connect to the supply of electricity; (a)(3)

Optical fiber cable. Installations of optical fiber cable made along with electric conductors. (a)(4)

(See 1910.399 for the definition of a "qualified person," and see 1910.332 for training requirements that apply.)

This section also covers work performed by *unqualified* persons on, near, or with the installations listed in paragraphs (c)(1) through (c)(4) of this section. (b)

This section does not apply to work performed by *qualified* persons on or directly associated with the following installations: (c)

The generation, transmission, and distribution of electric energy (including communication and metering) located in buildings used for such purposes or located outdoors; (c)(1)

Installation of communications covered under 1910.268; (c)(2)

Installation in vehicles, ships, watercraft, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles; (c)(3)

Installations of railways for generation, transformation, transmission, or distribution of power used exclusively for the operation of rolling stock or installations of railways used exclusively for signaling and communication purposes. (c)(4)

[**Note 1**: Work on utilization equipment used for purposes other than generating, transmitting, or distributing electric energy (i.e., installations which are in office buildings, warehouses, garages, machine shops, or recreation buildings), is covered under (a)(1) of this section.]

[**Note 2**: Work associated with generation transmission or distribution installation includes: (1) repairing overhead or underground distribution or repairing a feed-water pump for the boiler in a generating plant; (2) installations such as line-clearance, tree trimming, and replacing utility poles; (3) work on electric utilization circuits in a generating plant provided that: such circuits are commingled with installations of power generation equipment; and the generation equipment or circuits presents greater electrical hazards than posed by the utilization equipment or circuits.]

1910.332 — TRAINING

[Added 1990]

Scope

The following training requirements apply to workers who face the risk of electric shock that is not reduced to a safe level by the electrical installation requirements of 1910.303-.308. **(a)**

(**Note**: Table S-4 lists employees that need to be trained.)

Contents of training

Are employees trained in and familiar with the safety-related work practices required by 1910.331-.335? **(b)(1)**

Are employees who are covered by paragraph (a) and who are not qualified personnel trained in electrically-related safety practices not specifically addressed in 1910.331-.335? **(b)(2)**

Are qualified persons trained in the following: **(b)(3)**

The skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment; **(b)(3)(i)**

The skills and techniques necessary to determine the nominal voltage of exposed live parts; **(b)(3)(ii)**

The clearance distances specified in 1910.333(c) and the corresponding voltages to which the qualified person will be exposed. **(b)(3)(iii)**

[**Note 1:** A person must have the training required by paragraph (b)(3) of this section in order to be considered a qualified person.]

[**Note 2:** Qualified persons whose work on energized equipment involves either direct contact or contact by means of tools or materials must also have the training needed to meet 1910.333(c)(2).]

Type of training

Is the training provided either the classroom or on-the-job type?

Is the degree of training determined by the risk to the employee? **(c)**

TABLE S-4. TYPICAL OCCUPATIONAL CATEGORIES OF EMPLOYEES FACING A HIGHER THAN NORMAL RISK OF ELECTRICAL ACCIDENT

Occupation
Blue collar supervisors[1]
Electrical and electronic engineers[1]
Electrical and electronic equipment assemblers[1]
Electrical and electronic technicians[1]
Electricians
Industrial machine operators[1]
Material handling equipment operators[1]
Mechanics and repairers[1]
Painters[1]
Riggers and roustabouts[1]
Stationary engineers[1]
Welders

[1] Workers in these groups do not need to be trained if their work, or the work of those they supervise, does not bring them close enough to exposed parts of electric circuits operating at 50 volts or more to ground for a hazard to exist.

1910.333 — SELECTION AND USE OF WORK PRACTICES

[Added 1990]

Are safety-related work practices employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts? **(a)**

Are these practices consistent with the nature of the electrical hazards?

Are live parts de-energized before an employee works on or near them? **(a)(1)**

(The exception to this rule is if you can demonstrate that de-energizing parts increases hazards or is infeasible due to equipment design. Also, live parts operating at less than 50 volts to ground do not have to be de-energized if there is no increased exposure to electrical burns or to explosions due to electrical arcs.)

(**Note 1**: Examples of increased hazards include interruption of live support equipment, deactivation of emergency alarm systems, shutdown of hazardous location ventilation equipment, or removal of illumination for an area.)

1910.333 — SELECTION AND USE OF WORK PRACTICES

YES NO

Energized parts

If exposed live parts cannot be de-energized, are safety precautions (see paragraph c) taken to protect employees? **(a)(2)**

Are conductors or parts that have not been locked or tagged treated as energized parts? **(b)(1)**

Lockout and tagout

Are circuits which supply energy to parts locked out or tagged out in accordance with (b)(2)(ii)? **(b)(2)**

(See 1910.147, under Tab J, for more information on lockout/tagout.)

Procedures

Is a copy of procedures in paragraph (b)(2) kept on site for employee inspection?

Are safe procedures for de-energizing circuits determined before circuits or equipment are de-energized? **(b)(2)(ii)**

Are circuits and equipment disconnected from electric energy sources? **(b)(2)(ii)(B)**

(**Note**: Control circuit devices, such as push buttons, electric switches, and interlocks may not be used as the sole means for de-energizing circuits or equipment.)

Is stored energy released? **(b)(2)(ii)(C)**

Is stored electrical energy blocked or released so that parts cannot be accidentally energized? **(b)(2)(ii)(D)**

Is a lock and a tag placed on each disconnecting means to de-energize circuits and equipment, except as provided in paragraphs (b)(2)(iii)(C) and (b)(2)(iii)(E)? **(b)(2)(iii)(A)**

Does each tag state that unauthorized operation is prohibited? **(b)(2)(iii)(B)**

Is a tag substituted for a lock only if it can be demonstrated that tagging procedures will provide an adequate means of protection? **(b)(2)(iii)(C)**

When a tag is substituted for a lock, as permitted in paragraph (b)(2)(iii)(C), is it supplemented by at least one additional safety measure? **(b)(2)(iii)(D)**

A lock is placed without a tag only under the following conditions:

> Only one circuit or piece of equipment is de-energized;
>
> The lockout period does not extend beyond the work shift; and
>
> Employees exposed to the hazards associated with re-energizing the circuit are familiar with this procedure. **(b)(2)(iii)(E)**

Has a qualified person verified that the equipment cannot be restarted? **(b)(2)(iv)(A)**

Is all test equipment tested for normal operation?

Does a qualified person conduct tests and visual inspections to verify that all tools, electrical jumpers, shorts, grounds, and other devices have been removed so that circuits and equipment can be safely re-energized? **(b)(2)(iv)(B)**

Are employees exposed to the hazards associated with re-energizing the circuit or equipment warned to stay clear? **(b)(2)(v)(A)**

1910.333 — SELECTION AND USE OF WORK PRACTICES

YES NO

Is each lock and tag removed by the employee who applied it or under his or her direct supervision?

If the employee is absent from the workplace, is the lock or tag removed by a qualified person designated to perform this task?

Is the employee aware that the lock or tag has been removed before he or she resumes work at that workplace?

Is a visual determination made that all employees are clear of the circuits and equipment?

Work on or near energized parts

Are only qualified persons allowed to work on electric circuit parts or equipment that have not been de-energized under the procedures of paragraph (b) of this section? **(c)(1)**

Are such persons capable of working safely on energized circuits and familiar with the proper use of special precautionary techniques, personal protective equipment, and insulating tools? **(c)(2)**

Overhead lines

If work is to be performed near overhead lines, are the lines de-energized and grounded, or are other protective measures provided before work is started? **(c)(3)**

If the lines are to be de-energized, are arrangements made with the person or organization that operates or controls the electric circuits to de-energize and ground them?

If protective measures are provided such as guarding, isolating, or insulating, do these precautions prevent employees from contacting such lines directly with any part of their body or indirectly through conductive materials, tools, or equipment?

[**Note**: The work practices used by qualified persons installing insulating devices on overhead power transmission or distribution lines are not covered by 1910.332 through 1910.335. Under paragraph (c)(2) of this section, unqualified persons cannot perform this type of work.]

Unqualified persons

When an unqualified person is working in an elevated position near overhead lines, is the location such that the person and the longest conductive object he or she may contact cannot come closer to any unguarded, energized overhead line than the following distances: **(c)(3)(i)(A)**

> For voltages to ground 50k V or below 10 ft (305 cm), and
>
> For voltages to ground over 50k V 10 ft (305 cm) plus 4 in. (10 cm) for every 10k V over 50k V

When an unqualified person is working on the ground in the vicinity of overhead lines, is he or she prohibited from bringing any conductive object closer to unguarded, energized overhead lines than the distances given in paragraph (c)(3)(i)(A) of this section? **(c)(3)(i)(B)**

(**Note**: For voltages normally encountered with overhead power lines, objects which do not have an insulating rating for the voltage involved are considered to be conductive.)

Qualified persons

When a qualified person is working in the vicinity of overhead lines, whether in an elevated position or on the ground, is he or she prohibited from approaching or taking any conductive object without an approved insulating handle closer to exposed energized parts than shown in Table S-5 unless:

The person is insulated from the energized part. (Gloves, with sleeves if necessary, rated for the voltage involved are considered to be insulation of the person from the energized part on which work is performed.)

The energized part is insulated both from all other conductive objects at a different potential and from the person.

The person is insulated from all conductive objects at a potential different from that of the energized part. **(c)(3)(ii)(A-C)**

TABLE S-5 APPROACH DISTANCES FOR QUALIFIED EMPLOYEES ALTERNATING CURRENT

Voltage range (phase to phase)	Minimum approach distance
300V and less	Avoid contact
Over 300V, not over 750V	1 ft. 0 in (30.5 cm)
Over 750V, not over 2kV	1 ft. 6 in. (46 cm)
Over 2kV, not over 15kV	2 ft. 0 in. (61 cm)
Over 15kV, not over 37kV	3 ft. 0 in. (91 cm)
Over 37kV, not over 87.5kV	3 ft. 6 in. (107 cm)
Over 87.5 kV, not over 121kV	4 ft. 0 in. (122 cm)
Over 121kV, not over 140kV	4 ft. 6 in. (137 cm)

Vehicle and mechanical equipment

Is any vehicle or mechanical equipment, capable of having parts of its structure elevated near energized overhead lines, operated so that a clearance of 10 ft. (305 cm) is maintained? **(c)(3)(iii)**

If the voltage is higher than 50kV, is the clearance increased 4 inches (10 cm) for every 10kV over that voltage? **(c)(3)(iii)(A)**

Under any of the following conditions, the clearance may be reduced:

If the vehicle is in transit with its structure lowered, the clearance may be reduced to 4 ft. (122 cm).

If the voltage is higher than 50kV, the clearance will be increased 4 in. (10 cm) for every I0kV over that voltage. **(c)(iii)(A)(1)**

If insulating barriers are installed to prevent contact with the lines, and if the barriers are rated for the voltage of the line being guarded and are not a part of or an attachment to the vehicle or its raised structure, the clearance may be reduced to a distance within the designed working dimensions of the insulating barrier.

If the equipment is an aerial lift insulated for the voltage involved, and if the work is performed by a qualified person, the clearance (between the uninsulated portion of the aerial lift and the power line) may be reduced to the distance given in Table S-5. **(c)(3)(iii)(2-3)**

Are employees standing on the ground prohibited from contacting the vehicle or mechanical equipment or any of its attachments, unless:

The employee is using protective equipment rated for the voltage; or

The equipment is located so that no uninsulated part of its structure can come closer to the line than permitted in paragraph (c)(3)(iii)? **(c)(3)(iii)(B)**

If any vehicle or mechanical equipment, capable of having parts of its structure elevated near energized overhead lines, is intentionally grounded, are employees prohibited from standing at the grounding location whenever there is a possibility of overhead line contact? **(c)(3)(iii)(C)**

Are additional precautions, such as the use of barricades or insulation, taken to protect employees from hazardous ground potential depending on earth's resistivity and fault currents?

Illumination

Are employees prohibited from entering spaces containing exposed energized parts, unless illumination is provided that enables the employee to perform the work safely? **(c)(4)(i)**

Where there is a lack of illumination, are employees prohibited from performing tasks near exposed energized parts?

Confined spaces

When an employee works in a confined space that contains exposed energized parts, does he or she wear a protective shield or insulating material to avoid contact?

Are doors, hinged panels, etc., secured? **(c)(5)**

Conductive materials and equipment

Is conductive materials and equipment handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts?

If an employee must handle long dimensional conductive objects (such as ducts and pipes) in areas with exposed live parts, are work practices (such as the use of installation, guarding, and material handling techniques) instituted? **(c)(6)**

Portable ladders

Do portable ladders have nonconductive siderails if they are used where the employee or the ladder could contact exposed energized parts? **(c)(7)**

Conductive apparel

Are employees prohibited from wearing conductive articles of jewelry and clothing? **(c)(8)**

Housekeeping

Are safeguards, such as insulating equipment, used by employees performing housekeeping duties near live parts? **(c)(9)**

Is electrically-conductive cleaning material, such as steel wool and silicon carbide, prohibited near energized parts unless procedures are followed to prevent contact?

Are only qualified persons allowed to defeat an electrical safety interlock? **(c)(10)**

YES NO

1910.334 — USE OF EQUIPMENT

[Added 1990]

This section applies to the use of cord-and-plug connected equipment, including flexible cord sets.

Handling

Is portable equipment handled in a manner which will not cause damage?

Are flexible cords prohibited from being fastened with staples or otherwise hung in such a fashion that could damage the outer jack or insulation? **(a)(1)**

Visual inspection

Is portable equipment inspected before use?

If there is a defect or damage, is the item removed from service?

When an attachment plug is to be connected to a receptacle, is the relationship of the plug and receptacle contacts checked to ensure that they are proper mating configurations? **(a)(2)**

Does flexible cord equipment contain a grounding conductor? **(a)(3)**

Are employees prohibited from using adapters which interrupt the continuity of the equipment grounding conductor?

Are portable electrical equipment and flexible cords used in highly conductive work locations approved for those locations?

Are employees prevented from plugging equipment in with wet hands?

Are locking-type connectors properly secured after connection?

Electric power and lighting circuits

Are only load-rated switches, circuit breakers and other devices designed for that purpose used for the opening, reversing, or closing of circuits under load conditions? **(b)(1)**

After a circuit is de-energized by a circuit protective device, are employees instructed not to manually re-energize the circuit until it has been determined that it is safe? **(b)(2)**

Overcurrent protection

Are employees prohibited from modifying overcurrent protection of circuits and conductors, beyond what is allowed in 1910.304(e)? **(b)(3)**

Are test instruments properly inspected for external defects and damage before the equipment is used?

If there is a defect or evidence of damage that might expose an employee to injury, is the defective or damaged item removed from service?

Test instruments

Are only qualified persons allowed to perform testing work on electric circuits or equipment? **(c)(1)**

Rating of equipment

Are test instruments and equipment visually inspected for external defects and damage before the equipment is used? **(c)(2)**

YES NO

1910.334 — USE OF EQUIPMENT

Are test instruments and equipment and their accessories rated for the circuits and equipment to which they will be connected? **(c)(3)**

Occasional use of flammable or ignitible materials

Where flammable materials are present, is electric equipment capable of igniting prohibited, unless measures are taken to prevent hazardous conditions from developing? (See 1910.307.) **(d)**

1910.335 — SAFEGUARDS FOR PERSONNEL PROTECTION

[Added 1990]

Use of protective equipment

When working in areas where electrical hazards may exist, do employees wear the appropriate protective equipment? **(a)(1)(i)**

(**Note:** Personal protective equipment requirements are contained in Subpart I.)

Is personal protective equipment maintained in a safe condition? **(a)(1)(ii)**

If the insulating capability of protective equipment is subject to damage during use, is the insulating material protected? **(a)(1)(iii)**

Do employees wear nonconductive head protection when there is a danger of head injury from electric shock or burns due to contact with exposed energized parts? **(a)(1)(iv)**

Do employees wear protective equipment for the eyes or face whenever there is danger of injury to the eyes or face from electric arcs or flashes or from flying objects resulting from electrical explosion? **(a)(1)(v)**

General protective equipment and tools

When working near exposed energized conductors or circuit parts, does each employee use insulated tools or handling equipment if the tools or handling equipment might make contact with such conductors or parts? **(a)(2)**

If the insulating capability of insulated tools or handling equipment is subject to damage, is the insulating material protected? **(a)(2)(i)**

Is fuse handling equipment, insulated for the circuit voltage, used to remove or install fuses when the fuse terminals are energized?

Are ropes and handlines used near exposed energized parts nonconductive?

Are protective shields, protective barriers, or insulating materials used to protect each employee from shock, burns, or other electrically-related injuries while that employee is working near exposed energized parts? **(a)(2)(ii)**

When normally enclosed live parts are exposed for maintenance or repair, are they guarded to protect unqualified persons from contact with the live parts?

1910.335 – SAFEGUARDS FOR PERSONNEL PROTECTION

YES NO

Alerting techniques

Are the following alerting techniques used to warn and protect employees from hazards which could cause injury due to electric shock, burns, or failure of electric equipment parts:

Safety signs and tags.

Barricades used in conjunction with safety signs where it is necessary to prevent or limit employee access to work areas exposing employees to uninsulated energized conductors or circuit parts. Conductive barricades may not be used where they might cause an electrical contact hazard.

An attendant stationed if signs and barricades do not provide sufficient warning and protection. **(b)(1-3)**

(Federal Register Doc. 90-17951. 1910.331 effective 12/4/90: 1910.332 effective 8/6/91.)

1910.336 – 1910.360 [Reserved]
Safety-Related Maintenance Requirements

1910.361 – 1910.380 [Reserved]
Safety Requirements for Special Equipment

1910.381 – 1910.398 [Reserved]

1910.399 – Definitions
See pages S-ii – S-vii for definitions applicable to this Subpart

APPENDIX A TO 1910.331 – 1910.399 ELECTRICAL SAFETY-RELATED WORK PRACTICES

A. *Purpose.* This instruction establishes policies and provides interpretive guidelines to ensure uniform enforcement of the standard for Electrical Safety-Related Work Practices, 29 CFR 1910.331 through .335

B. *Scope.* This instruction applies OSHA-wide.

C. *References:*

1. OSHA Instruction STD 1-7.3, September 11, 1990, 29 CFR 1910.147, the control of Hazardous Energy (Lockout/Tagout) — Inspection Procedures and Interpretive Guidance.
2. General Industry Standards, 29 CFR 1910, Subpart S.
3. OSHA Instruction CPL 2.45B, June 15, 1989, the Revised Field Operations Manual (FOM).
4. NFPA 70E, 1983, Electrical Safety Requirements for Employees Workplaces.

D. *Effective Dates of Requirements.* All requirements of the standard for Electrical Safety-Related Work Practices have an effective date of December 4, 1990, except for 29 CFR 1910.332 (training), which will become effective on August 6, 1991.

E. *Action.* Regional Administrators and Area Directors shall ensure that the policies and interpretive guidelines in this instruction are followed as to the enforcement of the standard.

F. *Federal Program Change.* This instruction describes a Federal program change which affects State programs. Each Regional Administrator shall:

1. Ensure that this change is promptly forwarded to each State designee using a format consistent with the Plan Change Two-Way Memorandum in Appendix P, OSHA Instruction STP 2.22A, Ch-3.
2. Explain the technical content of this change to the State designee as required.
3. Ensure that State designees are asked to acknowledge receipt of this Federal program change in writing to the Regional Administrator as soon as the State's intention is known, but not later than 70 calendar days after the date of issuance (10 days for mailing and 60 days for response). This acknowledgment must include a description either of the State's plan to follow the guidelines in paragraphs H., Inspection guidelines, I., Interpretive Guidance, and J., Enforcement/Citation Guidance, to implement the change, or of the reasons why this change should not apply to that State.
4. Review policies, instructions and guidelines issued by the State to determine that this change has been communicated to State compliance personnel.

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G. *Background.* The standard for Electrical Safety-Related Work Practices was promulgated on August 6, 1990, at *Federal Register,* Vol. 55, No. 151 (pages 31984-32020), and became effective December 4, 1990, except for 29 CFR 1910.332, which becomes effective on August 6, 1991.

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1. The current electrical standards in Subpart S of the General Industry Standards cover electrical equipment and installations rather than work practices. The electrical safety-related work practice standards that do exist are distributed in other subparts of 29 CFR 1910. Although unsafe work practices appear to be involved in most workplace electrocutions, OSHA has very few regulations addressing work practices necessary for electrical safety. Because of this, OSHA determined that standards were needed to minimize these hazards.
2. The new rule addresses practices and procedures that are necessary to protect employees working on or near exposed energized and deenergized parts of electric equipment. The new rule also promotes uniformity and reduces redundancy among the general industry standards. The new rule is based largely on NFPA 70E, Part II.
3. On September 1, 1989, OSHA promulgated a generic standard on the control of hazardous energy, 29 CFR 1910.147 (Lockout/Tagout).

a. That standard addresses practices and procedures that are necessary to deenergize machinery or equipment and to prevent the release of potentially hazardous energy while maintenance and servicing activities are being performed.

b. Although that rule is related to electrical energy, it specifically excludes "exposure to electrical hazards from work on, near, or with conductors or equipment in electric utilization installations, which is covered by Subpart S of 29 CFR 1910." Therefore, the lockout/tagout standard *does not* cover electrical hazards.

c. The final electrical safety-related work practices standard has provisions to achieve maximum safety by deenergizing energized parts and, secondly, when lockout/tagout is used, it is done to ensure that the deenergized state is maintained.

H. *Inspection Guidelines.* In so far as possible the compliance officer shall integrate inspection procedures for this standard with those of 29 CFR 1910. 147 (lockout/tagout standard).

1. The following guidance provides a general framework to assist the compliance officer during all inspections:

a. The employer's written procedures required under 29 CFR 1910.333 (b)(2)(i) shall be reviewed to determine if they cover the hazards likely to be encountered.

(1) A copy of paragraph (b) of 1910.333 maintained by the employer will fulfill this requirement.

(2) A copy of the written procedures for locking and tagging required by 29 CFR 1910.147 will also comply with this requirement, provided those procedures address the electrical safety hazards covered by Subpart S and provided the procedures conform to 1910.333 (b).

(3) If the employer has chosen to utilize procedures developed to comply with 1910.147 for electrical as well as other hazards, the written procedures must include steps corresponding to requirements in Section 1910.333 for application of locks and tags and verification of deenergized conditions (29 CFR 1910.333 (b)(2)(iii)(D) and (b)(2)(iv)(B)).

(b) Beginning August 6, 1991, the training practices of the employer for qualified and unqualified employees shall be evaluated to assess whether the training provided is appropriate to the tasks being performed or to be performed.

(1) All employees who face a risk of electric shock, burns or other related injuries, not reduced to a safe level by the installation safety requirements of Subpart S, must be trained in safety-related work practices required by 29 CFR 1910.331 — .335.

(2) In addition to being trained in and familiar with safety related work practices, unqualified employees must be trained in the inherent hazards of electricity, such as high voltages, electric current, arcing, grounding, and lack of guarding. Any electrically related safety practices not specifically addressed by Sections 1910.331 through 1910.335 but necessary for safety in specific workplace conditions shall be included.

(3) The training of qualified employees must include at the minimum the following:

(a) The ability to distinguish exposed live parts from other parts of electric equipment.

(b) The ability to determine the nominal voltage of live parts.

(c) The knowledge of clearance and/or approach distances specified in 1910.333(c).

(4) During walkaround inspections, compliance officers shall evaluate any electrical-related work being performed to ascertain conformance with the employer's written procedures as required by 1910.333(b)(2)(i) and all safety-related work practices in Sections 1910.333 through 1910.335. (See J. of this instruction for clarification.)

(5) Any violations found must be documented adequately, including the actual voltage level.

I. *Interpretive Guidance.* The following guidance is provided relative to specific provisions of the standard for Electrical Safety-Related Work Practices:

1. *Definitions: Qualified/Unqualified Persons.*

   a. The standard defines a qualified person as one familiar with the construction and operation of the equipment and the hazards involved. "Qualified Persons" are intended to be only those who are well acquainted with and thoroughly conversant in the electric equipment and electrical hazards involved with the work being performed.

      (1) Whether an employee is considered to be a "qualified person" will depend on various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered "qualified" with regard to certain equipment in the workplace, but "unqualified" as to other equipment. (See 29 CFR 1910.332(b)(3) for training requirements that specifically apply to qualified persons.) Only qualified persons may place and remove locks and tags.

      (2) An employee who is undergoing on-the-job training, who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training, and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

   b. Where the term "may not" is used in these standards, the term bears the same meaning as "shall not".

   c. Training requirements apply to all employees in occupations that carry a risk of injury due to electrical hazards that are not sufficiently controlled under 29 CFR 1910.303 through 1910.308.

2. *Scope/Coverage of the Standard.*

   a. The provisions of the standard cover all employees working on, near or with premises wiring, wiring for connection to supply, other wiring, such as outside conductors on the premises and optical fiber cable, where the fiber cable installations are made along with electric conductors and the optical fiber cable types are those that contain noncurrent-carrying conductive members such as metallic strength members and metallic vapor barriers.

   b. The standard does not cover qualified workers (but does cover unqualified workers) performing work on the following:

      (1) Electric power generation, transmission, and distribution installations located in buildings used for such purposes or located outdoors.

      NOTE: Work on the *specified* electrical installations is excluded, but work on other electric equipment in the buildings is not excluded.

      (2) Communications installations covered under 29 CFR 1910.268.

      (3) Installations in ships, watercraft, railway rolling stock, aircraft, or automotive vehicles other than mobile homes and recreational vehicles.

      (4) Installations of railways for generation, transformation, transmission, or distribution of electric power used exclusively for operation of rolling stock or installations of railways used exclusively for signaling and communication purposes.

   c. The standard for Electrical Safety-Related Work Practices was developed to complement the existing electrical standards. The new standard includes requirements for work performed on or near exposed energized and deenergized parts of electric equipment, use of electrical protective equipment, and the safe use of electrical equipment.

   d. Exposure to unexpected electrical energy release that could result in electric shock or burns or in an explosion caused by an electric arc is covered by the standard for Electrical Safety-Related Work Practices. Safeguarding workers from other hazards related to the unexpected release of hazardous energy during servicing and maintenance operations is covered by 29 CFR 1910.147, the lockout/tagout standard.

      (1) 1910.333(a)(1) requires that live parts be deenergized before a potentially exposed employee works on or near them. OSHA believes that this is the preferred method for protecting employees from electrical hazards. The employer is permitted to allow employees to work on or near exposed live parts only:

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(a) If the employer can demonstrate that deenergizing introduces additional or increased hazards, or

(b) If the employer can demonstrate that deenergizing is infeasible due to equipment design or operational limitations.

(2) Under 1910.333 (a)(2) if the employer does not deenergize (under the conditions permitted in 1910.333 (a)(1), then suitable safe work practices for the conditions under which the work is to be performed shall be included in the written procedures and strictly enforced. These work practices are given in 1910.333 (c) and 1910.335

(3) Only qualified persons shall be allowed to work on energized parts or equipment.

3. *Working on Deenergized Parts.*

a. Circuit parts that cannot be deenergized using the procedures outlined in 1910.333 (b)(2) must be treated as energized (as specified in 1910.333 (b)(1), regardless of whether the parts are, in fact, deenergized.

b. Deenergized parts are required to be locked and tagged unless exempted under 1910.333 (b)(2)(iii)(c) or 1910.333 (b)(2)(iii)(E), as discussed below. If so exempted, either a lock or a tag is required.

(1) If a tag is used without a lock, it shall be supplemented by at least one additional safety measure that provides a level of safety equivalent to that obtained by the use of a lock. Examples of additional safety measures include the removal of an isolating circuit element, blocking of a controlling switch, or opening of an extra disconnecting device.

(2) A lock may be placed without a tag only under the following conditions:

(a) Only one circuit or piece of equipment is deenergized, and

(b) The lockout period does not extend beyond the work shift, and

(c) Employees exposed to the hazards associated with reenergizing the circuit or equipment are familiar with this procedure.

4. *Verification of Deenergization Is Mandatory.* This verification must be done by a qualified person.

a. The qualified person shall activate the equipment operating controls or otherwise verify that the equipment cannot be restarted.

b. Test equipment shall be used to ensure that electrical parts and circuit elements have been deenergized.

c. Testing instruments and equipment shall be visually inspected for external defects or damage before being used to determine deenergization (29 CFR 1910.334 (c)(2)).

d. For circuits over 600 volts nominal, the test equipment shall be checked for proper operation immediately before and immediately after the test.

5. *Reenergization.* The following requirements shall be met, in the order given, before circuits or equipment are reenergized, even temporarily.

a. A qualified person shall conduct tests and visual inspections, as necessary, to verify that all tools, electrical jumpers, shorts, grounds, and other such devices have been removed so that the circuits and equipment can be safely energized.

b. Potentially exposed employees shall be warned to stay clear of circuits and equipment prior to reenergizing.

c. Each lock and tag shall be removed by the employee who applied it. However, if the employee is absent from the workplace, then the lock or tag may be removed by a qualified person designated to perform this task provided that the employer ensures:

(1) That the employee who applied the lock or tag is not available at the workplace, and

(2) That the employee is informed that the lock or tag has been removed before he or she resumes work at the workplace.

(3) That there is to be a visual determination that all employees are clear of the circuits and equipment prior to lock and tag removal.

6. *Working on or Near Overhead Power Lines, 29 CFR 1910.333 (c)(3).*

a. OSHA believes that the preferred method of protecting employees working near overhead power lines is to deenergize and ground the lines when work is to be performed near them.

b. In addition to other operations, this standard also applies to tree trimming operations performed by tree workers who are not "qualified persons". In this respect the exclusion in 1910.331 (c)(1) applies only to "qualified persons" performing line-clearance tree trimming (trimming trees that are closer than 10 feet to overhead power lines).

c. The standard does not prohibit workers who are not "qualified persons" from working in a tree that is closer than 10 feet to power lines so long as that person or any object he or she may be using, does not come within 10 feet of a power line. However, it would require "qualified persons" to perform the work if the worker or any object he or she may be using will come within 10 feet of an exposed energized part or if a branch being cut may be expected to come within 10 feet of an exposed energized part while falling from the tree. (See 29 CFR 1910.333 (c)(3)(ii).)

d. The purpose for the approach distance requirements is to prevent contact with, and/or arcing, from energized overhead power lines. The approach distance applies to tools used by employees as well as the employees themselves. Table S-5 calls for the following approach distances for *qualified employees only:*

Voltage Range (AC) (phase to phase)	Minimum Approach Distance
300V and less	Avoid contact
Over 300V, not over 750V	1 ft. 0 in. (30.5cm)
Over 750, not over 2kV	1 ft. 6 in. (46cm)
Over 2kV, not over 15kV	2 ft. 0 in. (61cm)
Over 15kV, not over 37kV	3 ft. 0 in. (91cm)
Over 37kV, not over 87.5kV	3 ft. 6 in. (107cm)
Over 87.5kV, not over 121kV	4 ft. 0 in. (122cm)
Over 121kV, not over 140kV	4 ft. 6 in. (137cm)

NOTE: *Unqualified employees are required to adhere to the 10 ft. minimum.*

e. Employees working on or around vehicles and mechanical equipment, such as gin-pole trucks, forklifts, cherry pickers, garbage trucks, cranes and elevating platforms, who are potentially exposed to hazards related to equipment component contact with overhead lines, shall have been trained by their employers in the inherent hazards of electricity and means of avoiding exposure to such hazards.

f. The standard for Electrical Safety-Related Work Practices can be applied with respect to electrical hazards related to any size, utilization or configuration of overhead power lines in general industry; e.g., residential power lines, remotely located overhead power lines, temporarily rigged overhead power lines, and overhead power lines along streets and alleys.

7. *Portable Ladders.* Such ladders may not have conductive siderails in situations where the employee or the ladder could contact exposed energized parts. All ladders shall be in compliance with requirements of the standards found elsewhere in Part 1910.

8. *Conductive Apparel.* Articles of jewelry and clothing such as watch bands, bracelets, rings, key chains, necklaces, metalized aprons, cloth with conductive thread, or metal headgear shall not be worn if there is a possibility of contacting exposed energized parts. However, such articles may be worn if they are rendered nonconductive by covering, wrapping, or other insulating means (29 CFR 1910.333 (c)(8)).

9. *Housekeeping Duties.* The employer has the burden to provide adequate safeguards (such as insulating equipment or barriers) where live parts present an electrical contact hazard to employees who are performing housekeeping duties. Electrically conductive cleaning materials (such as steel wool, metalized cloth, and silicon carbide, as well as conductive liquid solutions) may not be used in proximity to energized parts unless procedures are followed which will prevent electrical contact.

10. *Electrical Safety Interlocks.* Interlocks found on panels, covers and guards are designed to deenergize circuits to prevent electric shock to persons using equipment or performing minor maintenance or adjustments and shall not be defeated or bypassed by an unqualified person.

11. *Cord- and Plug-Connected Equipment.* Energized equipment here means either the equipment being plugged or the receptacle into which it is being plugged, or both (29 CFR 1910.334 (a)(5)(i)).

12. *Eye and Face Protection.* 29 CFR 1910.335 (a)(1)(v) requires employees to wear protective equipment for the eyes or face wherever there is danger of injury to the eyes or face from electric arcs or flashes or from frying objects resulting from electrical explosion.
13. *Insulated Tool.* This means a tool encased within material of composition and thickness that is recognized as electrical insulation.

J. *Enforcement/Citation Guidance.*

1. A deficiency in the employer's program that could contribute to a potential exposure capable of producing serious physical harm or death shall be cited as a serious violation.
2. The failure to train "qualified" and "unqualified" employees as required for their respective classifications shall normally be cited as a serious violation.
3. Paperwork deficiencies in the safe work practice program where effective safe work practice procedures are in place shall be cited as other-than-serious.

OVERVIEW: SUBPART 1

COMMERCIAL DIVING OPERATIONS

This subpart covers safe procedures for diving and related operations in all industries — general industry, construction, and maritime. Excluded from coverage are instructional SCUBA diving within operations (see Appendix T-B on page T—App—2).

Specific sections of the standard covered in the checklist are:

Std. No.		Page No.
1910.401	**General**	T-01
1910.410	**Qualifications of dive team**	T-01
1910.420	**Safe practices manual**	T-01
1910.421	**Pre-dive procedures**	T-02
1910.422	**Procedures during dive**	T-03
1910.423	**Post-dive procedures**	T-03
1910.424	**SCUBA diving**	T-04
1910.425	**Surface-supplied air diving**	T-05
1910.426	**Mixed-gas diving**	T-05
1910.427	**Liveboating**	T-06
1910.430	**Equipment**	T-06
1910.440	**Recordkeeping requirements**	T-07

DEFINITIONS — SUBPART T

Acfm. Actual cubic feet per minute.

ASME Code or equivalent. American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section VIII, or an equivalent code which the employer can demonstrate to be equally effective.

ATA. Atmosphere absolute.

Bell. An enclosed compartment, pressurized (closed bell) or unpressurized (open bell), which allows the diver to be transported to and from the underwater work area and which may be used as a temporary refuge during diving operations.

Bottom time. The total elapsed time measured in minutes from the time when the diver leaves the surface in descent to the time that the diver begins ascent.

Bursting pressure. The pressure at which a pressure containment device would fail structurally.

Cylinder. A pressure vessel for the storage of gases.

Decompression chamber. A pressure vessel for human occupancy such as a surface decompression chamber, closed bell, or deep diving system used to decompress divers to treat decompression sickness.

Decompression sickness. A condition with a variety of symptoms which may result from gas or bubbles in the tissues of divers after pressure reduction.

Decompression table. A profile or set of profiles of depth-time relationships for ascent rates and breathing mixtures to be followed after a specific depth-time exposure or exposures.

Dive location. A surface or vessel from which a diving operation is conducted.

Dive-location reserve breathing gas. A supply system of air or mixed-gas (as appropriate) at the dive location which is independent of the primary supply system and sufficient to support divers during the planned decompression.

Dive team. Divers and support employees involved in a diving operation, including the designated person-in-charge.

Diver. An employee working in water using underwater apparatus which supplies compressed breathing gas at the ambient pressure.

Diver-carried reserve breathing gas. A diver-carried supply of air or mixed gas (as appropriate) sufficient under standard operating conditions to allow the diver to reach the surface, or another source of breathing gas, or to be reached by a standby diver.

Diving mode. A type of diving requiring specific equipment, procedures, and techniques (SCUBA, surface-supplied air, or mixed gas).

Fsw. Feet of seawater (or equivalent static pressure head).

Heavy gear. A diver-worn, deep-sea dress including helmet, breastplate, dry suit, and weighted shoes.

Hyperbaric conditions. Pressure conditions in excess of surface pressure.

Inwater stage. A suspended underwater platform which supports a diver in the water.

Liveboating. The practice of supporting a surface-supplied air or mixed gas diver from a vessel which is underway.

Mixed-gas diving. A diving mode in which the diver is supplied in the water with a breathing gas other than air.

No-decompression limits. The depth-time limits of the "no-decompression limits and repetitive dive group designation table for no-decompression air dives", U.S. Navy Diving Manual or equivalent limits which the employer can demonstrate to be equally effective.

Psi (g). Pounds per square inch (gauge).

Scientific diving. Diving performed solely as a necessary part of a scientific, research, or educational activity by employees whose sole purpose for diving is to perform scientific reseach tasks. Scientific diving does not include performing any tasks usually associated with commercial diving such as: placing or removing heavy objects underwater; inspection of pipelines and similar objects; construction; demolition; cutting or welding; or the use of explosives.

SCUBA diving. A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus.

Standby diver. A diver at the dive location available to assist a diver in the water.

Surface-supplied air diving. A diving mode in which the diver in the water is supplied from the dive location with compressed air for breathing.

Treatment table. A depth-time and breathing gas profile designed to treat decompression sickness.

Umbilical. The composite hose bundle between a dive location and a diver or bell, or between a diver and a bell, which supplies the diver or bell with breathing gas, communications, power, or heat as appropriate to the diving mode or conditions, and includes a safety line between the diver and the dive location.

Volume tank. A pressure vessel connected to the outlet of a compressor and used as an air reservoir.

Working pressure. The maximum pressure to which a pressure containment device may be exposed under standard operating conditions.

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YES NO

The following permanent standard became effective October 20, 1977. Provisions requiring decompression chambers or bells became effective April 20, 1978. It is recommended that any employer engaged in commercial diving operations procure the 2-volume set, *U.S. Navy Diving Manual*, which provides detailed guidance, standards, procedures and check-lists for all types of diving operations. Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 (price $18.00 per set).

1910.401 — GENERAL

(a) Scope.

The provisions of Subpart T apply to every place of employment within the waters of the United States, or within any State, the District of Columbia, Puerto Rico, Virgin Islands, American Samoa, Guam, Trust Territory of the Pacific Islands, Wake Island, Johnston Island, the Canal Zone or within the Outer Continental Shelf Lands, where diving and related support operations are performed. (a)(1)

This standard applies to diving and related support operations conducted in connection with all types of work and employment, including general industry, construction, ship repairing, shipbuilding, shipbreaking and longshoring. (a)(2)

This standard does NOT apply to any diving operation:

Performed solely for instructional purposes, using open-circuit, compressed air SCUBA and conducted within the no-decompression limits. (a)(2)(i)

Performed solely for search, rescue, or related public safety purposes by or under the control of a governmental agency. (a)(2)(ii)

Governed by 45 CFR Part 46 (Protection of Human Subjects, HEW) or equivalent rules or regulations established by another federal agency, which regulate research, development, or related purposes involving human subjects. (a)(2)(iii)

(b) Application in Emergencies.

Employers may deviate from the requirements of this standard to the extent necessary to prevent or minimize a situation which is likely to cause death, serious physical harm, or major environmental damage, provided: (b)

The Area Director, OSHA, is notified within 48 hours of the onset of the emergency situation, indicating the nature of the emergency and the extent of the deviation from the prescribed regulations. (b)(1)

The employer, upon request from the Area Director, submits such information in writing. (b)(2)

(c) Employer Obligation.

Is the following complied with:

All provisions of this standard of general applicability? (c)(1)

All requirements pertaining to the specific diving modes to the extent diving operations in such modes are conducted? (c)(2)

YES NO

1910.410 — QUALIFICATIONS OF DIVE TEAM

(a) General.

Does each dive team member have the experience or training necessary to perform assigned tasks in a safe and healthful manner? (a)(1)

Is each dive team member experienced or trained in the following:

Use of tools, equipment and systems relevant to assigned tasks? (a)(2)(i)

Techniques of the assigned diving mode? (a)(2)(ii)

Diving operations and emergency procedures? (a)(2)(iii)

Are all dive team members trained in cardiopulmonary resuscitation and first aid (American Red Cross standard course or equivalent)? (a)(3)

Are dive team members trained in diving-related physics and physiology when they are exposed to or control the exposure of others to hyperbaric conditions (pressure conditions in excess of surface pressure)? (a)(4)

(b) Assignments.

Is each dive team member assigned tasks in accordance with his experience or training? (b)(1)

NOTE: Limited additional tasks may be assigned while undergoing training and when performed under the direct supervision of an experienced dive team member.

Except when necessary to complete decompression or treatment procedures, are all exposures of dive team members to hyperbaric conditions voluntary? (b)(2)

Are dive team members prohibited from diving or being otherwise exposed to hyperbaric conditions for the duration of any known temporary physical impairment or condition which is likely to adversely affect their safety or health? (b)(3)

(c) Designated Person-in-Charge.

Is the employer or an employee designated by the employer at the dive location in charge of all aspects of the diving operation affecting the safety and health of dive team members? (c)(1)

Does the designated person-in-charge have experience and training in the conduct of the assigned diving operation? (c)(2)

1910.420 — SAFE PRACTICES MANUAL

(a) General.

Has a safe practices manual been developed, maintained, and made available at the dive location to each dive team member? (a)

(b) Contents.

Does the safe practices manual contain a copy of this standard and the employer's policies for implementing the requirements of this standard? (b)(1)

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1910.420 – SAFE PRACTICES MANUAL

	YES	NO
For each diving mode engaged in, does the safe practices manual include:		
Safety procedures and checklists for diving operations? (b)(1)(i)		
Assignments and responsibilities of the dive team members? (b)(2)(ii)		
Equipment procedures and checklists? (b)(2)(iii)		
Emergency procedures for fire, equipment failure, adverse environmental conditions, and medical illness and injury? (b)(2)(iv)		

1910.421 – PRE-DIVE PROCEDURES

(a) General.

	YES	NO
Have the following requirements been complied with prior to each diving operation, unless otherwise specified? (a)		

(b) Emergency Aid.

	YES	NO
Is a list kept at the dive location of the telephone or call numbers of the following: (b)		
An operational decompression chamber (if not at dive location)? (b)(1)		
Accessible hospitals? (b)(2)		
Available physicians? (b)(3)		
Available means of transportation? (b)(4)		
The nearest U.S. Coast Guard Rescue Coordination Center? (b)(5)		

NOTE: See Appendix T-D for a sample "Emergency Assistance Checklist" excerpted from the U.S. Navy Diving Manual.

(c) First Aid Supplies.

	YES	NO
Is a first aid kit, appropriate for the diving operation and approved by a physician, available at the dive location? (c)(1)		

NOTE: See Appendix T-C , excerpted from the U.S. Navy diving Manual, for suggested emergency medical supplies.

	YES	NO
When used in a decompression chamber or bell, is the first aid kit suitable for use under hyperbaric conditions? (c)(2)		
Is an American Red Cross standard first aid handbook or equivalent, and a bag-type manual resuscitator with transparent mask and tubing, available at the dive location? (c)(3)		

1910.421 – PRE-DIVE PROCEDURES

(d) Planning and Assessment.

	YES	NO
Does planning of a diving operation include an assessment of the safety and health aspects of the following: (d)		
Diving mode? (d)(1)		
Surface and underwater conditions and hazards? (d)(2)		
Breathing gas supply (including reserves)? (d)(3)		
Thermal protection? (d)(4)		
Diving equipment and systems? (d)(5)		
Dive team assignments and physical fitness of dive team members (including any impairment known to the employer)? (d)(6)		
Repetitive dive designation or residual inert gas status of dive team members? (d)(7)		
Decompression and treatment procedures (including altitude corrections)? (d)(8)		
Emergency procedure? (d)(9)		

NOTE: Appendix T-E has been excerpted from the U.S. Navy Diving Manual and modified to provide a sample "General Safety Checklist" for commercial diving operations.

(e) Hazardous Activities.

	YES	NO
To minimize hazards to the dive team, are diving operations coordinated with other activities in the vicinity which are likely to interfere with the diving operation? (e)		

(f) Employee Briefing.

	YES	NO
Are dive team members briefed on the following: (f)(1)		
The tasks to be undertaken? (f)(1)(i)		
Safety procedures for the diving mode? (f)(1)(ii)		
Any unusual hazards or environmental conditions likely to affect the safety of the diving operation? (f)(1)(iii)		
Any modifications of operating procedures necessitated by the specific diving operation? (f)(1)(iv)		
Prior to making individual dive team member assignments, does the employer inquire into the dive team member's current state of physical fitness, and indicate to the dive team member the procedure for reporting physical problems or adverse physiological effects during and after the dive? (f)(2)		

(g) Equipment Inspection.

	YES	NO
Is the breathing gas supply system, including reserve breathing gas supplies, masks, helmets, thermal protection, and bell handling mechanism (when appropriate) inspected prior to each dive? (g)		

(h) Warning Signal.

	YES	NO
When diving from surfaces other than vessels in areas capable of supporting marine traffic, is a rigid replica of the international code flag "A" at least one meter in height displayed at the dive location in a manner which allows allround visibility, and is it illuminated during night diving operations? (h)		

1910.422 – PROCEDURES DURING DIVE

YES NO

(a) General.

Have the following requirements which are applicable to each diving operation been complied with, unless otherwise specified? (a)

(b) Water Entry and Exit.

Is a means capable of supporting the diver provided for entering and exiting the water? (b)(1)

Does the means provided for exiting the water extend below the water surface? (b)(2)

Is a means provided to assist an injured diver from the water or into a bell? (b)(3)

(c) Communications.

Is an operational two-way voice communication system used between: (c)(1)

Each surface-supplied air or mixed-gas diver and a dive team member at the dive location or bell (when provided or required)? (c)(1)(i)

The bell and the dive location? (c)(1)(ii)

Is an operational, two-way communication system available at the dive location to obtain emergency assistance? (c)(2)

(d) Decompression Tables.

Are decompression, repetitive, and no-decompression tables (as appropriate) available at the dive location? (d)

NOTE: Appendix T-F has been excerpted from the U.S. Navy Diving Manual and provides Decompression, No-decompression and Repetitive Tables for Air Dives.

(e) Dive Profiles.

Is a depth-time profile, including (when appropriate) any breathing gas changes, maintained for each diver during the dive, including decompression? (e)

(f) Hand-Held Power Tools and Equipment.

Are hand-held electrical tools and equipment de-energized before being placed into or retrieved from the water? (f)(1)

Are hand-held power tools not supplied with power from the dive location until so requested by the diver? (f)(2)

(g) Welding and Burning.

Is a current supply switch provided to interrupt the current flow to the welding or burning electrode and is it: (g)(1)

Tended by a dive team member in voice communication with the diver performing the welding or burning? (g)(1)(i)

Kept in the open position except when the diver is welding or burning? (g)(1)(ii)

Is the welding machine frame grounded? (g)(2)

Are the welding and burning cable, electrode holders, and connections capable of carrying the maximum current required by the work, and are they properly insulated? (g)(3)

1910.422 – PROCEDURES DURING DIVE

YES NO

Are insulated gloves provided to divers performing welding and burning operations? (g)(4)

Prior to welding or burning on closed compartments, are structures or pipes which contain a flammable vapor or in which a flammable vapor may be generated by the work, vented, flooded or purged with a mixture of gases which will not support combustion? (g)(5)

(h) Explosives.

Are explosives transported, stored and used in accordance with this section and the applicable provisions of 1910.109 and 1926.912 of 29 CFR? (h)(1)

Is electrical continuity of explosive circuits not tested until the diver is out of the water? (h)(2)

Are explosives not detonated while the diver is in the water? (h)(3)

(i) Temination of the Dive.

Is the working interval of a dive terminated when: (i)

A diver requests termination? (i)(1)

A diver fails to respond correctly to communications or signals from a dive team member? (i)(2)

Communications are lost and can not be quickly re-established between the diver and a dive team member at the dive location, and between the designated person-in-charge and the person controlling the vessel in liveboating operations? (i)(3)

A diver begins to use diver-carried reserve breathing gas or the dive-location reserve breathing gas? (i)(4)

1910.423 – POST DIVE PROCEDURES

(a) General.

Have the following requirements which are applicable after each diving operation been complied with, unless otherwise specified? (a)

(b) Precautions.

Is the following accomplished after the completion of any dive: (b)(1)

Check the physical condition of the diver? (b)(1)(i)

Instruct the diver to report any physical problems or adverse physiological effects, including symptoms of decompression sickness? (b)(1)(ii)

Advise the diver of the location of a decompression chamber which is ready for use? (b)(1)(iii)

Alert the diver to the potential hazards of flying after diving? (b)(1)(iv)

For any dive outside the no-decompression limits, deeper than 100 feet of seawater (fsw) or using mixed gas as a breathing mixture, has the diver been instructed to remain awake and in the vicinity of the decompression chamber which is at the dive location for at least one hour after the dive (including decompression treatment, as appropriate)? (b)(2)

YES NO

1910.423 – POST DIVE PROCEDURES

(c) Recompression Capability.

Is a decompression chamber capable of recompressing a diver at the surface to a minimum of 165 fsw (6 ATA [atmosphere absolute]) available to the dive location for: (c)(1)

Surface-supplied air diving to depths deeper than 100 fsw and shallower than 220 fsw? (c)(1)(i)

Mixed gas diving shallower than 300 fsw? (c)(1)(ii)

Diving outside the no-decompression limits shallower than 300 fsw? (c)(1)(iii)

Is a decompression chamber capable of recompressing the diver at the surface to the maximum depth of the dive available at the dive location for dives deeper than 300 fsw? (c)(2)

Is the decompression chamber dual-lock, multiplace, and located within 5 minutes of the dive location?(c)(3)(i)-(iii)

Is the decompression chamber equipped with: (c)(4)

A pressure gauge for each pressurized compartment designed for human occupancy? (c)(4)(i)

A built-in breathing system with a minimum of one mask per occupant? (c)(4)(ii)

A two-way voice communication system between occupants and a dive team member at the dive location? (c)(4)(iii)

A view port? (c)(4)(iv)

Illumination capability to light the interior? (c)(4)(v)

Are treatment tables, treatment gas appropriate to the diving mode, and sufficient gas to conduct treatment available at the dive location? (c)(4)

Is a dive team member available at the dive location during and for at least one hour after the dive to operate the decompression chamber (when required or provided)? (c)(5)

(d) Record of Dive.

Is the following information recorded and maintained for each diving operation: (d)(1)

Names of dive team members, including designated person-in-charge? (d)(1)(i)

Date, time and location? (d)(1)(ii)

Diving modes used? (d)(1)(iii)

General nature of work performed? (d)(1)(iv)

Approximate underwater and surface conditions (visibility, water temperature and current)? (d)(1)(v)

Maximum depth and bottom time for each diver? (d)(1)(vi)

Is the following additional information recorded and maintained for each dive outside the no-decompression limits, deeper than 100 fsw or using mixed gas? (d)(2)

Depth-time and breathing gas profiles? (d)(2)(i)

Decompression table designation (including modification)? (d)(2)(ii)

Elapsed time since last pressure exposure if less than 24 hours, or repetitive dive designation for each diver? (d)(2)(iii)

YES NO

1910.423 – POST DIVE PROCEDURES

Is the following additional information recorded and maintained for each dive in which decompression sickness is suspected or symptoms are evident? (d)(3)

Description of decompression sickness symptoms (including depth and time of onset)? (d)(3)(i)

Description and results of treatment? (s)(3)(ii)

(e) Decompression Procedure Assessment.

Does the employer accomplish the following: (e)

Investigate and evaluate each incident of decompression sickness based on the recorded information, consideration of the past performance of decompression table used, and individual susceptibility? (e)(1)

Take appropriate corrective action to reduce the probability of recurrence of decompression sickness? (e)(2)

Prepare a written evaluation of the decompression procedure assessment, including any corrective action taken, within 45 days of the incident of decompression sickness? (e)(3)

1910.424 – SCUBA DIVING

SCUBA diving is defined as: "A diving mode independent of surface supply in which the diver uses open circuit self-contained underwater breathing apparatus."

(a) General.

Are the following requirements complied with when engaged in SCUBA diving, unless otherwise specified? (a)

(b) Limits.

Is SCUBA diving prohibited under the following conditions: (b)

At depths greater than 130 fsw? (b)(1)

At depths greater than 100 fsw or outside the no-decompression limits, unless a decompression chamber is ready for use? (b)(2)

Against currents exceeding 1 knot, unless line-tended? (b)(3)

In enclosed or physically confining spaces, unless line-tended? (b)(4)

(c) Procedures.

Is a standby diver available while a diver is in the water? (c)(1)

Is a diver line-tended from the surface, or accompanied by another diver in the water in continuous visual contact during the diving operation? (c)(2)

Is a diver stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces? (c)(3)

YES NO

1910.424 – SCUBA DIVING

Is a diver-carried reserve breathing gas supply provided for each diver consisting of: (c)(4)

A manual reserve (J valve); or (c)(4)(i)

An independent reserve cylinder, with a separate regulator or connected to the underwater breathing apparatus? (c)(4)(ii)

Is the valve of the reserve breathing gas supply in the closed position prior to the dive? (c)(5)

1910.425 – SURFACE-SUPPLIED AIR DIVING

Surface-supplied air diving is defined as: "A diving mode in which the diver in the water is supplied from the dive location with compressed air for breathing."

(a) General.

Are the following requirements complied with when engaged in surface-supplied air diving, unless otherwise specified? (a)

(b) Limits.

Is surface-supplied air diving prohibited at depths greater than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw? (b)(1)

Is a decompression chamber ready for use at the dive location for any dive outside the no-decompression limits or deeper than 100 fsw? (b)(2)

Is a bell used for dives with an in-water decompression time greater than 120 minutes, except when heavy gear is worn or diving is conducted in physically confining spaces? (b)(3)

(c) Procedures.

Is each diver continuously tended while in the water? (c)(1)

Is a diver stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces? (c)(2)

Does each diving operation have a primary breathing gas supply sufficient to support divers for the duration of the planned dive, including decompression? (c)(3)

Is the following complied with for dives at depths greater than 100 fsw or outside the no-decompression limits: (c)(4)

A separate dive team member shall tend each diver in the water? (c)(4)(i)

A standby diver shall be available while a diver is in the water? (c)(4)(ii)

A diver-carried reserve breathing gas supply shall be provided for each diver, except when heavy gear is worn? (c)(4)(iii)

A dive-location reserve breathing gas supply shall be provided? (c)(4)(iv)

YES NO

1910.425 – SURFACE-SUPPLIED AIR DIVING

Is the following complied with for heavy-gear diving at depths greater than 100 fsw or outside the no-decompression limits: (c)(5)

An extra breathing gas hose capable of supplying breathing gas to the diver in the water shall be available to the standby diver? (c)(5)(i)

An inwater stage shall be provided to divers in the water? (c)(5)(ii)

Except when heavy gear is worn or where physical space does not permit, is a diver-carried reserve breathing gas supply provided whenever the diver is prevented by the configuration of the dive area from ascending directly to the surface? (c)(6)

1910.426 – MIXED-GAS DIVING

Mixed-gas diving is defined as: "A diving mode in which the diver is supplied in the water with a breathing gas other than air."

(a) General.

Are the following requirements complied with when engaged in mixed-gas diving, unless otherwise specified? (a)

(b) Limits.

Is mixed-gas diving conducted only when: (b)

A decompression chamber is ready for use at the dive location? (b)(1)

A bell is used at depths greater than 220 fsw or when the dive involves in-water decompression time of greater than 120 minutes, except when heavy gear is worn or when diving in physically confining spaces? (b)(1)(i)

A closed bell is used at depths greater than 300 fsw, except when diving is conducted in physically confining spaces? (b)(1)(ii)

(c) Procedures.

Does a separate dive team member tend each diver in the water? (c)(1)

Is a standby diver available while a diver is in the water? (c)(2)

Is a diver stationed at the underwater point of entry when diving is conducted in enclosed or physically confining spaces? (c)(3)

Does each diving operation have a primary breathing gas supply sufficient to support divers for the duration of the planned dive, including decompression? (c)(4)

Does each diving operation have a dive-location reserve breathing gas supply? (c)(5)

When heavy gear is worn: (c)(6)

Is an extra breathing gas hose capable of supplying breathing gas to the diver in the water available to the standby diver? (c)(6)(i)

Is an in-water stage provided to divers in the water? (c)(6)(ii)

YES NO

1910.426 – MIXED-GAS DIVING

Is an in-water stage provided for divers without access to a bell for dives deeper than 100 fsw or outside the no-decompression limits? (c)(7)

When a closed bell is used, is one dive team member in the bell available to tend the diver in the water? (c)(8)

Except when heavy gear is worn or where physical space does not permit, is a diver-carried reserve breathing gas supply provided for each diver when:

- Diving deeper than 100 fsw or outside the no-decompression limits? (c)(9)(i)
- Prevented by the configuration of the dive area from directly ascending to the surface? (c)(9)(ii)

1910.427 — LIVEBOATING

Liveboating is defined as: "The practice of supporting a surface-supplied air or mixed-gas diver from a vessel which is underway."

(a) General.

Are the following requirements complied with when engaged in diving operations involving liveboating? (a)

(b) Limits.

Are diving operations involving liveboating prohibited under the following conditions: (b)

- Dives with an in-water decompression time of greater than 120 minutes? (b)(1)
- Dives using surface-supplied air at depths greater than 190 fsw, except that dives with bottom times of 30 minutes or less may be conducted to depths of 220 fsw? (b)(2)
- Dives using mixed-gas at depths greater than 220 fsw? (b)(3)
- Dives in rough seas which significantly impede diver mobility or work function? (b)(4)
- Dives in other than daylight hours? (b)(5)

(d) Procedures.

Is the propeller of the vessel stopped before the diver enters or exits the water? (d)(1)

Is a device used to minimize the possibility of entanglement of the diver's hose in the propeller of the vessel? (d)(2)

Is two-way voice communication between the designated person-in-charge and the person controlling the vessel available while the diver is in the water? (d)(3)

Is a standby diver available while a diver is in the water? (d)(4)

Is a diver-carried reserve breathing gas supply carried by each diver engaged in the liveboating operations? (d)(5)

YES NO

1910.430 – EQUIPMENT

(a) General.

Are the following requirements complied with, unless otherwise specified? (a)(1)

Is each equipment modification, repair, test, calibration or maintenance service recorded by means of a tagging or logging system, which includes the date and nature of work performed, and the name or initials of the person performing the work? (a)(2)

(b) Air Compression Systems.

Are compressors used to supply air to the diver equipped with a volume tank with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve? (b)(1)

Are air compressor intakes located away from areas containing exhaust or other contaminants? (b)(2)

Is the respirable air supplied to the diver free from:

- A level of carbon monoxide (CO) greater than 20 ppm? (b)(3)(i)
- A level of carbon dioxide (CO_2) greater than 1,000 ppm? (b)(3)(ii)
- A level of oil mist greater than 5 milligrams per cubic meter? (b)(3)(iii)
- A noxious or pronounced odor? (b)(3)(iv)

Is the output of the air compressor systems tested for air purity every six months by means of samples taken at the connection to the distribution system, except that non-oil lubricated compressors need not be tested for oil mists? (b)(4)

(c) Breathing Gas Supply Hoses.

Do breathing gas supply hoses meet the following requirements: (c)(1)

- Have a working pressure at least equal to the working pressure of the total breathing gas system? (c)(1)(i)
- Have a rated busting pressure at least equal to 4 times the working pressure? (c)(1)(ii)
- Be tested at least annually to 1.5 times their working pressure? (c)(1)(iii)
- Have their open ends taped, capped or plugged when not in use? (c)(1)(iv)

Do breathing gas supply hose connectors meet the following requirements: (c)(2)

- Be made of corrosion-resistant materials? (c)(2)(i)
- Have a working pressure at least equal to the working pressure of the hose to which they are attached? (c)(2)(ii)
- Be resistant to accidental disengagement? (c)(2)(iii)

Do umbilicals meet the following requirements: (c)(3)

- Be marked in 10-foot increments to 100 feet, beginning at the diver's end, and in 50-foot increments thereafter? (c)(3)(i)
- Be made of kink-resistant materials? (c)(3)(ii)
- Have a working pressure greater than the pressure equivalent to the maximum depth of the dive (relative to the supply source) plus 100 psi? (c)(3)(iii)

1910.430 – EQUIPMENT

	YES	NO
(d) Buoyancy Control.		
Are helmets or masks connected directly to the dry suit or other buoyancy-changing equipment equipped with an exhaust valve? (d)(1)		
Are dry suits or other buoyancy-changing equipment not directly connected to the helmet or mask equipped with an exhaust valve? (d)(2)		
When used for SCUBA diving, does a buoyancy compensator have an inflation source separate from the breathing gas supply? (d)(3)		
For SCUBA diving, is an inflatable flotation device capable of maintaining the diver at the surface in a face-up position, having a manually activated inflation source independent of the breathing supply, an oral inflation device, and an exhaust valve used? (d)(4)		
(e) Compressed Gas Cylinders.		
Do compressed gas cylinders meet the following requirements:		
Be designed, constructed and maintained in accordance with the applicable provisions of 29 CFR 1910.166-171? (e)(1)		
Be stored in a ventilated area and protected from excessive heat? (e)(2)		
Be secured from falling? (e)(3)		
Have shut-off valves recessed into the cylinder or protected by a cap, except when in use or manifolded, or when used for SCUBA diving? (e)(4)		
(f) Decompression Chambers.		
Is each decompression chamber manufactured after October 20, 1977, built and maintained in accordance with the ASME Code or equivalent? (f)(1)		
Is each decompression chamber manufactured prior to October 20, 1977, maintained in conformity with the code requirements to which it was build, or equivalent? (f)(2)		
Is each decompression chamber equipped with: (f)(3)		
Means to maintain the atmosphere below a level of 25% oxygen by volume? (f)(3)(i)		
Mufflers on intake and exhaust lines, which shall be regularly inspected and maintained? (f)(3)(ii)		
Suction guards on exhaust line openings? (f)(3)(iii)		
A means for extinguishing fire, and shall be maintained to minimize sources of ignition and combustible material? (f)(3)(iv)		
(g) Gauges and Timekeeping Devices.		
Are gauges indicating diver depth, which can be read at the dive location, used for all dives except SCUBA? (g)(1)		
Is each depth gauge dead-weight tested or calibrated against a master reference gauge every six months, and when there is a discrepancy greater than 2% of full scale between two equivalent gauges? (g)(2)		

1910.430 – EQUIPMENT

	YES	NO
Is a cylinder pressure gauge capable of being monitored by the diver during the dive worn by each SCUBA diver? (g)(3)		
Is a timekeeping device available at each dive location? (g)(4)		
(h) Masks and Helmets.		
Do surface-supplied air and mixed-gas masks and helmets have: (h)(1)		
A non-return valve at the attachment point between helmet or mask and hose which shall close readily and positively? (h)(1)(i)		
An exhaust valve? (h)(1)(ii)		
Do surface-supplied air masks and helmets have a minimum ventilation rate capability of 4.5 acfm at any depth at which they are operated or the capability of maintaining the diver's inspired carbon dioxide partial pressure below 0.02 ATA when the diver is producing carbon dioxide at the rate of 1.6 standard liters per minute? (h)(2)		
(i) Oxygen Safety.		
Is equipment used with oxygen or mixtures containing over 40% by volume oxygen designed for oxygen service? (i)(1)		
Are components (except umbilicals) exposed to oxygen or mixtures containing over 40% by volume oxygen cleaned of flammable materials before use? (i)(2)		
Do oxygen systems over 125 psig and compressed air systems over 500 psig have slow-opening shut-off valves? (i)(3)		
(j) Weights and Harnesses.		
Except when heavy gear is worn, are divers equipped with a weight belt or assembly capable of quick release? (j)(1)		
Except when heavy gear is worn or in SCUBA diving, does each diver wear a safety harness with: (j)(2)		
A positive buckling device? (j)(2)(i)		
An attachment point for the umbilical to prevent strain on the mask or helmet? (j)(2)(ii)		
A lifting point to distribute the pull force of the line over the diver's body? (j)(2)(iii)		

1910.440 – RECORDKEEPING REQUIREMENTS

	YES	NO
(a) Recording and Reporting.		
Are all occupational injuries and illnesses recorded and reported in accordance with the requirements of 29 CFR Part 1904? (a)(1)		
Is any diving-related injury or illness which requires any dive team member to be hospitalized for 24 hours or more recorded, specifying the circumstances of the incident and the extent of any injuries and illnesses? (a)(2)		

1910.440 – RECORDKEEPING REQUIREMENTS

(b) Availability of Records.

	YES	NO
Is any record or document required by this standard made available for inspection and copying upon request to the Assistant Secretary of Labor or the Director of NIOSH, or their designees? **(b)(1)**		
Is any record or document required by this standard which pertains to an individual employee or former employee made available for inspection or copying, upon request of that employee, former employee or authorized representative? **(b)(2)**		
Are the records and documents required by this standard retained for the following period: **(b)(3)**		
Dive team member medical records for 5 years (physician's reports)(Section 1910.411)? **(b)(3)(i)**		
Safe practices manual (Section 1910.420) – current document only? **(b)(3)(ii)**		
Depth-time profile (Section 1910.422) – until completion of the recording of dive, or until completion of decompression procedure assessment where there has been an incident of decompression sickness? **(b)(3)(iii)**		
Recording of dive (Section 1910.423) – 1 year, except 5 years where there has been an incident of decompression sickness? **(b)(3)(iv)**		
Decompression procedure assessment evaluations (Section 1910.423) – 5 years? **(b)(3)(v)**		
Equipment inspections and testing records (Section 1910.430) – current entry or tag, or until equipment is withdrawn from service? **(b)(3)(vi)**		
Records of hospitalizations (Section 1910.440) – 5 years? **(b)(3)(vii)**		
Are those records which are required to be kept for 5 years forwarded to the National Institute for Occupational Safety and Health (NIOSH) after expiration of the retention period? **(b)(4)**		
Is the following accomplished in the event the employer ceases to do business: **(b)(5)**		
The successor employer shall receive and retain all dive and employee medical records required by this standard? **(b)(5)(i)**		
If there is no successor employer, dive and employee medical records shall be forwarded to NIOSH? **(b)(5)(ii)**		

	YES	NO

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APPENDIX T-A – EXAMPLES OF CONDITIONS WHICH MAY RESTRICT OR LIMIT EXPOSURE TO HYPERBARIC CONDITIONS

The following disorders may restrict or limit occupational exposure to hyperbaric conditions depending on severity, presence of residual effects, response to therapy, number of occurrences, diving mode, or degree and duration of isolation.

History of seizure disorder other than early febrile convulsions.

Malignancies (active) unless treated and without recurrence for 5 years.

Chronic inability to equalize sinus and/or middle ear pressure.

Cystic or cavitary disease of the lungs.

Impaired organ function caused by alcohol or drug use.

Conditions requiring continuous medication for control (e.g., antihistamines, steroids, barbiturates, moodaltering drugs, or insulin).

Meniere's disease.

Hemoglobinopathies.

Obstructive or restrictive lung disease.

Vestibular end organ destruction.

Pneumothorax.

Cardiac abnormalities (e.g., pathological heart block, valvular disease, intraventricular conduction defects other than isolated right bundle branch block, angina pectoris, arrhythmia, coronary artery disease).

Juxta-articular osteonecrosis.

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APPENDIX T-B
GUIDELINES FOR SCIENTIFIC DIVING

This appendix contains guidelines that will be used in conjunction with 1910.401(a)(2)(iv) to determine those scientific diving programs which are exempt from the requirements for commercial diving. The guidelines are as follows:

1. The Diving Control Board consists of a majority of active scientific divers and has autonomous and absolute authority over the scientific diving program's operations.

2. The purpose of the project using scientific diving is the advancement of science; therefore, information and data resulting from the project are non-proprietary.

3. The tasks of a scientific diver are those of an observer and data gatherer. Construction and trouble-shooting tasks traditionally associated with commercial diving are not included within scientific diving.

4. Scientific divers, based on the nature of their activities, must use scientific expertise in studying the underwater environment and, therefore, are scientists, or scientists in training.

(Appendix B added by 50 FR 1050, January 9, 1985)

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APPENDIX T-C
EMERGENCY MEDICAL SUPPLIES

The number and variety of emergencies that can arise in diving require that a considerable number of items of medical equipment and supplies be available for prompt use by the medical officer or corpsman. What must be kept immediately at hand for first-aid and subsequent treatment depends somewhat on the availability of such items from the ship's regular sickbay or from a dispensary or hospital close to a shore-based diving activity. The possible needs and means of filling them should be considered carefully and appropriate steps taken by the medical officer or corpsman responsible.

Every diving activity must **maintain** an emergency kit which can be available immediately at the scene of a diving accident. The kit should be small enough to carry into the chamber immediately. Because many sterile items must be considered contaminated after exposure to increased atmospheric pressure, it is desirable to have a primary and a secondary emergency kit.

Kit No.1 – Primary Emergency Kit
Diagnostic equipment needed routinely, and equipment most likely to be needed immediately.

Kit No. 2 – Secondary Emergency Kit
Equipment and medicines that might be needed, but that can be sent into the chamber if specifically required.

SUGGESTED CONTENTS OF EMERGENCY KITS

A. Kit No. 1

Diagnostic equipment routinely useful:

1. Flashlight
2. Stethoscope
3. Otoscope-opthalmoscope
4. Sphygmomanometer (aneroid type, never mercury)
5. Reflex hammer
6. Tuning fork
7. Pin and brush for sensory testing
8. Tongue depressors

Emergency treatment equipment and medications:

1. Tongue depressors taped and padded as a bite pad for use in case of convulsions
2. Oropharyngeal airway
3. Rubber tubes equivalent to sizes 4 and 6 for temporary use in a tracheotomy, with a safety pin through that end to be kept outside the trachea
4. Sterile scalpel and blade assortment
5. Sterile hemostats (two each)
6. 5-cc syringe (two each) with needles
7. Bandage scissors
8. Epinephrine 1:1,000 aqueous for injection
9. Sterile gauze pads
10. Cotton balls
11. Benzalkonium chloride

Miscellaneous:

1. Adhesive tape
2. Tourniquet

B. Kit No. 2

Emergency equipment:

1. Suture material, sterile
2. Suture needles, assorted, sterile
3. Sterile syringes:
   5cc, 2 each
   10cc, 2 each
   30cc, 2 each
   Sterile needles, 16, 18, 20 and 22 gage, preferably disposable
4. Three-way stopcocks, sterile, 2 each
5. Sterile thoracentesis needle, 16 gage, 4" long
6. Sterile intracardiac needle
7. Sterile rubber tube for endotracheal suction (a soft-tip tube causes less damage to the trachea)
8. Endotracheal tubes, cuffed, selection
9. Laryngoscope

Emergency medications

1. Intravenous fluids:
   5 percent dextrose in saline
   5 percent dextrose in water
   Ringer's injection, lactated
2. Lidocaine
3. Cortico steroid for intravenous or intramuscular injection
4. Amobarbital sodium, injectable
5. Phenobarbital, injectable
6. Diazepam, injectable
7. Diphenylylhydantain sodium, injectable
8. Chloropromazine, injectable
9. Codeine, tablets
10. Aspirin
11. An injectable antihistamine
12. Sterile water for injection
13. Surgical soap

Miscellaneous

1. Nasogastric tube
2. Asepto syringe
3. Sterile bladder catheterization tray (preferably disposable)
4. Intravenous infusion kits, sterile, disposable (two each)
5. Gauze roller bandage, 1" and 2," sterile
6. Gauze sponges, 4" by 4," sterile
7. Band-Aids
8. Sterile gloves, surgical
9. Sterile towels
10. Splints
11. AMBU-type resuscitator
12. Eye patch

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USE OF THE EMERGENCY KIT

The sterile supplies, if not adequately sealed against the increased atmospheric pressure, should be resterilized after each pressure exposure, or, if not exposed, at 6-month intervals.

Not all drug ampules will withstand pressure, and bottle stoppers may be pushed in. Bottles with stoppers may be vented with a needle during pressurization, and then discarded if not used.

Because the available facilities may differ on board ship, at land-based diving installations, and at diver-training or experimental units, the responsible medical officer or hospital man will have to modify the emergency kits to suit the local needs. Both kits should be taken to the recompression chamber or scene of the accident.

The emergency kit should be sealed in such a way that it can be opened readily when needed but will not be opened and plundered for no good cause. A broken seal will indicate that it has been opened. The kit should contain a list of contents, and each time it is opened (or at monthly intervals in any case), it should be checked for presence and condition of all items. Sterile supplies should be provided in duplicate so that one set can be autoclaved in the meantime.

Normally, use of the emergency kit should be restricted to the medical officer or a well-trained corpsman. Concise instructions for administration of each drug should be provided in the kit. In untrained hands, many of the items can be dangerous. Remember, that as in all types of treatment, YOUR FIRST DUTY IS NOT TO DO HARM.

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APPENDIX T-D
EMERGENCY ASSISTANCE CHECKLIST

RECOMPRESSION CHAMBER

Location

Contact

Response Time

AIR TRANSPORTATION

Location

Contact

Response Time

SEA TRANSPORTATION

Location

Contact

Response Time

HOSPITAL

Location

Contact

Response Time

DIVING MEDICAL OFFICER

Location

Contact

Response Time

SUPPLIES

Location

Contact

Response Time

COMMUNICATIONS

Location

Contact

Response Time

DIVING UNITS

Location

Contact

Response Time

COMMAND

Location

Contact

Response Time

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APPENDIX T-E
GENERAL SAFETY CHECKLIST

STEPS IN PLANNING OF DIVING OPERATIONS

A. ☐ **ANALYZE THE JOB FOR SAFETY**

Advanced planning is the **greatest single safety precaution** that can be taken.

- ☐ Objective definition
- ☐ Environmental conditions
- ☐ Emergency assistance
- ☐ Relevant OSHA and U.S. Coast Guard Regulations

B. ☐ **PINPOINT POTENTIAL HAZARDS**

- ☐ **Natural Hazards**
  1. Atmospheric:
     - ☐ Extreme exposure of personnel to elements
     - ☐ Adverse exposure of equipment and supplies to elements
     - ☐ Delays or disruption caused by weather
  2. Surface:
     - ☐ Sea sickness
     - ☐ Water entry and exit
     - ☐ Handling of heavy equipment in rough seas
     - ☐ Maintaining location in tides and currents
     - ☐ Ice, flotsam, kelp, petroleum disrupting operations
     - ☐ Delays or disruption caused by sea state
  3. Underwater and Bottom:
     - ☐ Depth exceeds diving limits or limits of available equipment
     - ☐ Exposure to cold temperatures
     - ☐ Dangerous marine life
     - ☐ Tides and currents
     - ☐ Limited visibility
     - ☐ Bottom obstructions
     - ☐ Dangerous bottom conditions (mud, drop-offs, sewer outfalls, etc.)
- ☐ **"On-Site" Hazards**
  - ☐ Local marine traffic
  - ☐ High powered, active sonar
  - ☐ Other conflicting naval operations
  - ☐ Other conflicting commercial operations
  - ☐ Radiation contamination
  - ☐ Pollution
- ☐ **Mission Hazards**
  - ☐ Decompression sickness
  - ☐ Communications problems
  - ☐ Drowning
  - ☐ Other trauma (injuries)
- ☐ **Object Hazards**
  - ☐ Entrapment
  - ☐ Entanglement
  - ☐ Pollution, toxic
  - ☐ Explosives or other ordnance
  - ☐ Shifting or "working" of objects

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C. ☐ MINIMIZE HAZARDS AND PLAN FOR EMERGENCIES

☐ **Diving Personnel**
- ☐ 1. Assign a complete and properly qualified Diving Team.
- ☐ 2. Assign the right man to the right task.
- ☐ 3. Verify that each member of the Diving Team is properly trained and qualified for the equipment and depths involved.
- ☐ 4. Determine that each man is physically fit to dive, paying attention to:
  - ☐ General condition
  - ☐ Last record of medical exam
  - ☐ Ears and sinuses
  - ☐ Severe cold or flu
  - ☐ Use of stimulants or intoxicants
  - ☐ Fatigue
- ☐ 5. Determine each man's **emotional** fitness to dive (as far as possible):
  - ☐ Motivation (willingness)
  - ☐ Stability

☐ **Diving Equipment**
- ☐ 1. Verify that the type of diving gear chosen (and diving technique) is adequate for the mission and particular task.
- ☐ 2. Verify that the type of equipment and diving technique is proper for the depth involved.
- ☐ 3. Verify that all equipment has been tested and approved for use.
- ☐ 4. Determine that all necessary support equipment and tools are readily available, and are the best for accomplishing the job efficiently and **safely.**
- ☐ 5. Determine that all related support equipment such as winches, boats, cranes, floats, etc. are operable, safe, and under the control of trained personnel.
- ☐ 6. Check that all diving equipment has been properly maintained with appropriate records, and is in full operating condition.

☐ **Provide for Emergency Equipment**
- ☐ 1. Obtain suitable communications equipment with sufficient capability to reach "outside help." Check all communications for proper functioning.
- ☐ 2. Verify that a recompression chamber is ready for use, or notify the nearest location having one that its use may be required within a given time frame.
- ☐ 3. Verify that a First Aid kit is near at hand, and is completely stocked.
- ☐ 4. If oxygen will be used as standby first aid, verify that the tank is full, properly pressurized, and that all masks, valves and other accessories are fully operable.
- ☐ 5. If a resuscitator will be used, check the apparatus for function.
- ☐ 6. Check that all fire-fighting equipment is readily available and in full operating condition.
- ☐ 7. Verify that Emergency transportation is either standing by, or on immediate call.

☐ **Establish Emergency Procedures**
- ☐ 1. Know how to obtain medical assistance immediately.
- ☐ 2. Assign specific tasks to the Diving Team and support personnel for different emergencies.
- ☐ 3. Develop and **Post** the **Emergency Assistance Checklist,** and ensure that all personnel are familiar with it.
- ☐ 4. Verify that a copy of the Decompression Tables is available and up-to-date.
- ☐ 5. Be sure that all divers, boat crews, and other support personnel understand all diver hand signals.
- ☐ 6. Pre-determine distress signals and call-signs with all members of the diving team, boat crews, and other activities.
- ☐ 7. Be sure that all divers have removed anything from their mouths which might choke them during a dive (gum, dentures, tobacco).

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☐ 8. Thoroughly drill and train all personnel in Emergency Procedures, with particular attention to cross-training. Drills should include:

Emergency Recompression
Fire
Rapid Dressing
Restoration of Breathing
Electric Shock
Entrapment
Rapid Undressing
First Aid
Embolism
Drowning
Blow-Up

D. ☐ ESTABLISH SAFE DIVING OPERATIONAL PROCEDURES

☐ 1. Be sure that contigency planning has been conducted.

☐ 2. Carefully state the goals of each mission, and develop a flexible plan of operations.

☐ 3. Completely brief the Diving Team and support personnel.

☐ 4. Designate a properly qualified Diving Supervisor to be in charge of the mission.

☐ 5. Designate a timekeeper and verify that he understands his duties and responsibilities.

☐ 6. Determine the exact depth at the job-site through the use of a lead line or pneumofathometer.

☐ 7. Verify the existence of an adequate supply of compressed air available for all planned diving operations **plus** an adequate reserve for emergencies.

☐ 8. Be sure that no operations or action on the part of the Diving Team, support personnel, boat crews, technicians, winch operators, etc. may take place without the knowledge and by direct command of the Diving Supervisor.

☐ 9. All efforts must be made to reduce and minimize "bottom-time." Remember in all cases, water depth and the condition of the diver (especially fatigue) rather than the amount of work to be done shall govern the diver's bottom time.

☐ 10. Decompression tables should be on hand, be up-to-date, and be used in all planning and scheduling of diving operations.

☐ 11. Instruct all divers and support personnel not to cut any lines until that action is approved by the Diving Supervisor.

☐ 12. Be sure that the ship, boat, or diving craft is securely moored and in position to permit the safest and most efficient operations (except in the case of emergency and critical ship repairs).

☐ 13. Verify, when using surface-supplied techniques, that the ship, boat or diving craft is in at least a two-point moor.

☐ 14. Ensure that, when conducting SCUBA operations, the boat can be quickly cast off and moved to a diver in distress.

☐ 15. Ensure that each diver checks his own equipment **in addition** to checks made by tenders, technicians, or other support personnel.

☐ 16. Designate a standby diver for all surface-supplied operations. And, check that the standby diver is dressed (including breastplate) and ready to enter the water if needed.

☐ 17. Assign buddy divers for all SCUBA operations.

☐ 18. All efforts should be made to prevent the divers from being fouled on the bottom. If work is to be conducted inside a wreck or similar underwater structure, designate a team of divers to accomplish the task. One diver will enter the wreck, the other shall tend his lines from the point of entry.

☐ 19. When using explosives, take appropriate measures to ensure that no charge will be fired while divers are in the water.

☐ 20. Use appropriate safety procedures for all underwater cutting and welding operations.

☐ 21. Brief all divers and deck personnel on the planned decompression schedules for each particular dive. Check provisions made for decompressing the diver.

☐ 22. Verify that the ship, boat, or diving craft is displaying the proper signals, flags, dayshapes, or lights to indicate diving operations are in progress. (Consult appropriate publications governing International or Inland Rules & International/Inland local signals.)

- ☐ 23. Ensure that proper protection against harmful marine life has been provided. If marksmen are used to protect against shark, verify that they do not have automatic weapons.
- ☐ 24. Check that the quality of diver's air supply is periodically and thoroughly tested to ensure purity.
- ☐ 25. For dives conducted from a small boat to a depth of 120 feet or greater, a standby air supply is mandatory.
- ☐ 26. Ensure that, when diving from a small boat to depths of 120 feet or greater, a standby boat is available at the scene.
- ☐ 27. Thoroughly brief the boat crew using the Diving Boat Operations Checklist.
- ☐ 28. Verify that proper safety and operational equipment is aboard small diving boats or craft (see Boat Equipment Checklist).

☐ **Notify Proper Parties that DiveOps Are Ready to Commence**

- ☐ 1. Bridge, to ensure that ship's personnel **will not**:
  - ☐ Turn the propeller or thrusters
  - ☐ Get underway
  - ☐ Activate active sonar or other electronics
  - ☐ Drop heavy items overboard
  - ☐ Shift the moor
  - ☐ Operate rudder or steering mechanisms
- ☐ 2. Harbor Master
- ☐ 3. U.S. Coast Guard
- ☐ 4. Notify Emergency Facilities having recompression chambers, as well as sources of Emergency Transportation, that Diving Operations are underway and their assistance may be needed.

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APPENDIX T-F — U.S. NAVY STANDARD AIR DECOMPRESSION TABLE

Depth (feet)	Bottom Time (Min)	Time First Stop (Min:Sec)	Decompression Stops (Feet) 50	40	30	20	10	Total Ascent (Min:Sec)	Repetitive Group
40	200						0	0:40	*
	210	0:30					2	2:40	N
	230	0:30					7	7:40	N
	250	0:30					11	11:40	O
	270	0:30					15	15:40	O
	300	0:30					19	19:40	Z
	360	0:30					23	23:40	**
	480	0:30					41	41:40	**
	720	0:30					69	69:40	**
50	100						0	0:50	*
	110	0:40					3	3:50	L
	120	0:40					5	5:50	M
	140	0:40					10	10:50	M
	160	0:40					21	21:50	N
	180	0:40					29	29:50	O
	200	0:40					35	35:50	O
	220	0:40					40	40:50	Z
	240	0:40					47	47:50	Z
60	60						0	1:00	*
	70	0:50					2	3:00	K
	80	0:50					7	8:00	L
	100	0:50					14	15:00	M
	120	0:50					26	27:00	N
	140	0:50					39	40:00	O
	160	0:50					48	49:00	Z
	180	0:50					56	57:00	Z
	200	0:40				1	69	71:00	Z
	240	0:40				2	79	82:00	**
	360	0:40				20	119	140:00	**
	480	0:40				44	148	193:00	**
	720	0:40				78	187	266:00	**
70	50						0	1:10	*
	60	1:00					8	9:10	K
	70	1:00					14	15:10	L
	80	1:00					18	19:10	M
	90	1:00					23	24:10	N
	100	1:00					33	34:10	N
	110	0:50				2	41	44:10	O
	120	0:50				4	47	52:10	O
	130	0:50				6	52	59:10	O
	140	0:50				8	56	65:10	Z
	150	0:50				9	61	71:10	Z
	160	0:50				13	72	86:10	Z
	170	0:50				19	79	99:10	Z

*See No Decompression Table for repetitive groups

**Repetitive dives may not follow exceptional exposure dives

Depth (feet)	Bottom Time (Min)	Time First Stop (Min:Sec)	Decompression Stops (Feet)					Total Ascent (Min:Sec)	Repetitive Group
			50	40	30	20	10		
80	40						0	1:20	*
	50	1:10					10	11:20	K
	60	1:10					17	18:20	L
	70	1:10					23	24:20	M
	80	1:00				2	31	34:20	N
	90	1:00				7	39	47:20	N
	100	1:00				11	46	58:20	O
	110	1:00				13	53	67:20	O
	120	1:00				17	56	74:20	Z
	130	1:00				19	63	83:20	Z
	140	1:00				26	69	96:20	Z
	150	1:00				32	77	110:20	Z
	180	1:00				35	85	121:20	**
	240	0:50			6	52	120	179:20	**
	360	0:50			29	90	160	280:20	**
	480	0:50			59	107	187	354:20	**
	720	0:40		17	108	142	187	455:20	**
90	30						0	1:30	*
	40	1:20					7	8:30	J
	50	1:20					18	19:30	L
	60	1:20					25	26:30	M
	70	1:10				7	30	38:30	N
	80	1:10				13	40	54:30	N
	90	1:10				18	48	67:30	O
	100	1:10				21	54	76:30	Z
	110	1:10				24	61	86:30	Z
	120	1:10				32	68	101:30	Z
	130	1:00			5	36	74	116:30	Z
100	25						0	1:40	*
	30	1:30					3	4:40	I
	40	1:30					15	16:40	K
	50	1:20				2	24	27:40	L
	60	1:20				9	28	38:40	N
	70	1:20				17	39	57:40	O
	80	1:20				23	48	72:40	O
	90	1:10			3	23	57	84:40	Z
	100	1:10			7	23	66	97:40	Z
	110	1:10			10	34	72	117:40	Z
	120	1:10			12	41	78	132:40	Z
	180	1:00		1	29	53	118	202:40	**
	240	1:00		14	42	84	142	283:40	**
	360	0:50	2	42	73	111	187	416:40	**
	480	0:50	21	61	91	142	187	503:40	**
	720	0:50	55	106	122	142	187	613:40	**

*See No Decompression Table for repetitive groups
**Repetitive dives may not follow exceptional exposure dives

Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet)							Total Ascent (Min:Sec)	Repetitive Group
			70	60	50	40	30	20	10		
110	20								0	1:50	*
	25	1:40							3	4:50	H
	30	1:40							7	8:50	J
	40	1:30						2	21	24:50	L
	50	1:30						8	26	35:50	M
	60	1:30						18	36	55:50	N
	70	1:20					1	23	48	73:50	O
	80	1:20					7	23	57	88:50	Z
	90	1:20					12	30	64	107:50	Z
	100	1:20					15	37	72	125:50	Z
120	15								0	2:00	*
	20	1:50							2	4:00	H
	25	1:50							6	8:00	I
	30	1:50							14	16:00	J
	40	1:40						5	25	32:00	L
	50	1:40						15	31	48:00	N
	60	1:30					2	22	45	71:00	O
	70	1:30					9	23	55	89:00	O
	80	1:30					15	27	63	107:00	Z
	90	1:30					19	37	74	132:00	Z
	100	1:30					23	45	80	150:00	Z
	120	1:20				10	19	47	98	176:00	**
	180	1:10			5	27	37	76	137	284:00	**
	240	1:10			23	35	60	97	179	396:00	**
	360	1:00		18	45	64	93	142	187	551:00	**
	480	0:50	3	41	64	93	122	142	187	654:00	**
	720	0:50	32	74	100	114	122	142	187	773:00	**
130	10								0	2:10	*
	15	2:00							1	3:10	F
	20	2:00							4	6:10	H
	25	2:00							10	12:10	J
	30	1:50						3	18	23:10	M
	40	1:50						10	25	37:10	N
	50	1:40					3	21	37	63:10	O
	60	1:40					9	23	52	86:10	Z
	70	1:40					16	24	61	103:10	Z
	80	1:30				3	19	35	72	131:10	Z
	90	1:30				8	19	45	80	154:10	Z

*See No Decompression Table for repetitive groups

**Repetitive dives may not follow exceptional exposure dives

Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet)									Total Ascent (Min:Sec)	Repetitive Group
			90	80	70	60	50	40	30	20	10		
140	10										0	2:20	*
	15	2:10									2	4:20	G
	20	2:10									6	8:20	I
	25	2:00								2	14	18:20	J
	30	2:00								5	21	28:20	K
	40	1:50							2	16	26	46:20	N
	50	1:50							6	24	44	76:20	O
	60	1:50							16	23	56	97:20	Z
	70	1:40						4	19	32	68	125:20	Z
	80	1:40						10	23	41	79	155:20	Z
	90	1:30					2	14	18	42	88	166:20	**
	120	1:30					12	14	36	56	120	240:20	**
	180	1:20				10	26	32	54	94	168	386:20	**
	240	1:10			8	28	34	50	78	124	187	511:20	**
	360	1:00		9	32	42	64	84	122	142	187	684:20	**
	480	1:00		31	44	59	100	114	122	142	187	801:20	**
	720	0:50	16	56	88	97	100	114	122	142	187	924:20	**
150	5										0	2:30	C
	10	2:20									1	3:30	E
	15	2:20									3	5:30	G
	20	2:10								2	7	11:30	H
	25	2:10								4	17	23:30	K
	30	2:10								8	24	34:30	L
	40	2:00							5	19	33	59:30	N
	50	2:00							12	23	51	88:30	O
	60	1:50						3	19	26	62	112:30	Z
	70	1:50						11	19	39	75	146:30	Z
	80	1:40					1	17	19	50	84	173:30	Z
160	5										0	2:40	D
	10	2:30									1	3:40	F
	15	2:20								1	4	7:40	H
	20	2:20								3	11	16:40	J
	25	2:20								7	20	29:40	K
	30	2:10							2	11	25	40:40	M
	40	2:10							7	23	39	71:40	N
	50	2:00						2	16	23	55	98:40	Z
	60	2:00						9	19	33	69	132:40	Z
	70	1:50					1	17	22	44	80	166:40	Z

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*See No Decompression Table for repetitive groups

**Repetitive dives may not follow exceptional exposure dives

Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet)											Total Ascent (Min:Sec)	Repetitive Group
			110	100	90	80	70	60	50	40	30	20	10		
170	5												0	2:50	D
	10	2:40											2	4:50	F
	15	2:30										2	5	9:50	H
	20	2:30										4	15	21:50	J
	25	2:20									2	7	23	34:50	L
	30	2:20									4	13	26	45:50	M
	40	2:10								1	10	23	45	81:50	O
	50	2:10								5	18	23	61	109:50	Z
	60	2:00							2	15	22	37	74	152:50	Z
	70	2:00							8	17	19	51	86	183:50	Z
	90	1:50						12	12	14	34	52	120	246:50	**
	120	1:30				2	10	12	18	32	42	82	156	356:50	**
	180	1:20			4	10	22	28	34	50	78	120	187	535:50	**
	240	1:20			18	24	30	42	50	70	116	142	187	681:50	**
	360	1:10		22	34	40	52	60	98	114	122	142	187	873:50	**
	480	1:00	14	40	42	56	91	97	100	114	122	142	187	1007:50	**
180	5												0	3:00	D
	10	2:50											3	6:00	F
	15	2:40										3	6	12:00	I
	20	2:30									1	5	17	26:00	K
	25	2:30									3	10	24	40:00	L
	30	2:30									6	17	27	53:00	N
	40	2:20								3	14	23	50	93:00	O
	50	2:10							2	9	19	30	65	128:00	Z
	60	2:10							5	16	19	44	81	168:00	Z
190	5												0	3:10	D
	10	2:50										1	3	7:10	G
	15	2:50										4	7	14:10	I
	20	2:40									2	6	20	31:10	K
	25	2:40									5	11	25	44:10	M
	30	2:30								1	8	19	32	63:10	N
	40	2:30								8	14	23	55	103:10	O
	50	2:20							4	13	22	33	72	147:10	Z
	60	2:20							10	17	19	50	84	183:10	Z

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*See No Decompression Table for repetitive groups

**Repetitive dives may not follow exceptional exposure dives

Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet)													Total Ascent (Min:Sec)
			130	120	110	100	90	80	70	60	50	40	30	20	10	
200	5	3:10													1	4:20
	10	3:00												1	4	8:20
	15	2:50											1	4	10	18:20
	20	2:50											3	7	27	40:20
	25	2:50											7	14	25	49:20
	30	2:40										2	9	22	37	73:20
	40	2:30									2	8	17	23	59	112:20
	50	2:30									6	16	22	39	75	161:20
	60	2:20								2	13	17	24	51	89	199:20
	90	1:50					1	10	10	12	12	30	38	74	134	324:20
	120	1:40				6	10	10	10	24	28	40	64	98	180	473:20
	180	1:20		1	10	10	18	24	24	42	48	70	106	142	187	685:20
	240	1:20		6	20	24	24	36	42	54	68	114	122	142	187	842:20
	360	1:10	12	22	36	40	44	56	82	98	100	114	122	142	187	1058:20
210	5	3:20													1	4:30
	10	3:10												2	4	9:30
	15	3:00											1	5	13	22:30
	20	3:00											4	10	23	40:30
	25	2:50										2	7	17	27	56:30
	30	2:50										4	9	24	41	81:30
	40	2:40									4	9	19	26	63	124:30
	50	2:30								1	9	17	19	45	80	174:30
220	5	3:30													2	5:40
	10	3:20												2	5	10:40
	15	3:10											2	5	16	26:40
	20	3:00										1	3	11	24	42:40
	25	3:00										3	8	19	33	66:40
	30	2:50									1	7	10	23	47	91:40
	40	2:50									6	12	22	29	68	140:40
	50	2:40								3	12	17	18	51	86	190:40
230	5	3:40													2	5:50
	10	3:20											1	2	6	12:50
	15	3:20											3	6	18	30:50
	20	3:10										2	5	12	26	48:50
	25	3:10										4	8	22	37	74:50
	30	3:00									2	8	12	23	51	99:50
	40	2:50								1	7	15	22	34	74	156:50
	50	2:50								5	14	16	24	51	89	202:50
240	5	3:50													2	6:00
	10	3:30											1	3	6	14:00
	15	3:30											4	6	21	35:00
	20	3:20										3	6	15	25	53:00
	25	3:10									1	4	9	24	40	82:00
	30	3:10									4	8	15	22	56	109:00
	40	3:00								3	7	17	22	39	75	167:00
	50	2:50							1	8	15	16	29	51	94	218:00

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Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet)													Total Ascent (Min:Sec)
			130	120	110	100	90	80	70	60	50	40	30	20	10	
250	5	3:50												1	2	7:10
	10	3:40											1	4	7	16:10
	15	3:30										1	4	7	22	38:10
	20	3:30										4	7	17	27	59:10
	25	3:20									2	7	10	24	45	92:10
	30	3:20									6	7	17	23	59	116:10
	40	3:10								5	9	17	19	45	79	178:10
	60	2:40					4	10	10	10	12	22	36	64	126	298:10
	90	2:10		8	10	10	10	10	10	28	28	44	68	98	186	514:10
260	5	4:00												1	2	7:20
	10	3:50											2	4	9	19:20
	15	3:40										2	4	10	22	42:20
	20	3:30									1	4	7	20	31	67:20
	25	3:30									3	8	11	23	50	99:20
	30	3:20								2	6	8	19	26	61	126:20
	40	3:10							1	6	11	16	19	49	84	190:20
270	5	4:10												1	3	8:30
	10	4:00											2	5	11	22:30
	15	3:50										3	4	11	24	46:30
	20	3:40									2	3	9	21	35	74:30
	25	3:30								2	3	8	13	23	53	106:30
	30	3:30								3	6	12	22	27	64	138:30
	40	3:20							5	6	11	17	22	51	88	204:30
280	5	4:20												2	2	8:40
	10	4:00										1	2	5	13	25:40
	15	3:50									1	3	4	11	26	49:40
	20	3:50									3	4	8	23	39	81:40
	25	3:40								2	5	7	16	23	56	113:40
	30	3:30							1	3	7	13	22	30	70	150:40
	40	3:20						1	6	6	13	17	27	51	93	218:40
290	5	4:30												2	3	9:50
	10	4:10										1	3	5	16	29:50
	15	4:00									1	3	6	12	26	52:50
	20	4:00									3	7	9	23	43	89:50
	25	3:50								3	5	8	17	23	60	120:50
	30	3:40							1	5	6	16	22	36	72	162:50
	40	3:30						3	5	7	15	16	32	51	95	228:50
300	5	4:40												3	3	11:00
	10	4:20										1	3	6	17	32:00
	15	4:10									2	3	6	15	26	57:00
	20	4:00								2	3	7	10	23	47	97:00
	25	3:50							1	3	6	8	19	26	61	129:00
	30	3:50							2	5	7	17	22	39	75	172:00
	40	3:40						4	6	9	15	17	34	51	90	231:00
	60	3:00		4	10	10	10	10	10	14	28	32	50	90	187	460:00

Extreme Exposures – 250 and 300 Feet

Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet) 200	190	180	170	160	150	140	130	120	110	Total Ascent (Min:Sec)
250	120	1:50							5	10	10	10	684:10
	180	1:30					4	8	8	10	22	24	931:10
	240	1:30					9	14	21	22	22	40	1109:10

Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet) 100	90	80	70	60	50	40	30	20	10	Total Ascent (Min:Sec)
250	120	1:50	10	16	24	24	36	48	64	94	142	187	684:10
	180	1:30	24	32	42	44	60	84	114	122	142	187	931:10
	240	1:30	40	42	56	76	98	100	114	122	142	187	1109:10

Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet) 200	190	180	170	160	150	140	130	120	110	Total Ascent (Min:Sec)
300	90	2:20					3	8	8	10	10	10	693:00
	120	2:00			4	8	8	8	8	10	14	24	890:00
	180	1:40	6	8	8	8	14	20	21	21	28	40	1168:00

Depth (feet)	Bottom Time (Min)	Time to First Stop (Min:Sec)	Decompression Stops (Feet) 100	90	80	70	60	50	40	30	20	10	Total Ascent (Min:Sec)
300	90	2:20	10	16	24	24	34	48	64	90	142	187	693:00
	120	2:00	24	24	34	42	58	66	102	122	142	187	890:00
	180	1:40	40	48	56	82	98	100	114	122	142	187	1168:00

NO-DECOMPRESSION LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR NO-DECOMPRESSION AIR DIVES

The No-Decompression Table serves two purposes. First it summarizes all the depth and bottom time combinations for which no decompression is required. Secondly, it provides the repetitive group designation for each no-decompression dive. Even though decompression is not required, an amount of nitrogen remains in the diver's tissues after every dive. If he dives again within a 12 hour period, the diver must consider this residual nitrogen when calculating his decompression.

Each depth listed in the No-Decompression Table has a corresponding **no-decompression limit** given in minutes. This limit is the maximum bottom time that a diver may spend at that depth without requiring decompression. The columns to the right of the no-decompression limits column are used to determine the repetitive group designation which must be assigned to a diver subsequent to every dive. To find the repetitive group designation enter the table at the depth equal to or next greater than the actual depth of the dive. Follow that row to the right to the bottom time equal to or next greater than the actual bottom time of the dive. Follow that column upward to the repetitive group designation.

Depths above 35 feet do not have a specific no-decompression limit. They are, however, restricted in that they only provide repetitive group designations for bottom times up to between five and six hours. These bottom times are considered the limitations of the No-Decompression Table and no field requirement for diving should extend beyond them.

Any dive below 35 feet which has a bottom time greater than the no-decompression limit given in this table is a decompression dive and should be conducted in accordance with the Standard Air Table.

EXAMPLE

Problem:

In planning a dive, the Master Diver wants to conduct a brief inspection of the work site, located 160 feet below the surface. What is the maximum bottom time which he may use without requiring decompression? What is his repetitive group designation after the dive?

Solution:

The no-decompression limit corresponding to the 160 foot depth in the No-Decompression Table is five minutes. Therefore, the Master Diver must descend to 160 feet, make his inspection and begin his ascent within 5 minutes without having to undergo decompression.

Following the 160 foot depth row to the five minute column, the repetitive group designation at the top of this column is D.

NO-DECOMPRESSION LIMITS AND REPETITIVE GROUP DESIGNATION TABLE FOR NO-DECOMPRESSION AIR DIVES

Depth (Feet)	No-decompression Limits (Min)	Group Designation														
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
10		60	120	210	300											
15		35	70	110	160	225	350									
20		25	50	75	100	135	180	240	325							
25		20	35	55	75	100	125	160	195	245	315					
30		15	30	45	60	75	95	120	145	170	205	250	310			
35	310	5	15	25	40	50	60	80	100	120	140	160	190	220	270	310
40	200	5	15	25	30	40	50	70	80	100	110	130	150	170	200	
50	100		10	15	25	30	40	50	60	70	80	90	100			
60	60		10	15	20	25	30	40	50	55	60					
70	50		5	10	15	20	30	35	40	45	50					
80	40		5	10	15	20	25	30	35	40						
90	30		5	10	12	15	20	25	30							
100	25		5	7	10	15	20	22	25							
110	20			5	10	13	15	20								
120	15			5	10	12	15									
130	10			5	8	10										
140	10			5	7	10										
150	5			5												
160	5				5											
170	5				5											
180	5				5											
190	5				5											

RESIDUAL NITROGEN TIMETABLE FOR REPETITIVE AIR DIVES

The quantity of residual nitrogen in a diver's body immediately after a dive is expressed by the repetitive group designation assigned to him by either the Standard Air Table or the No-Decompression Table. The upper portion of the Residual Nitrogen Table is composed of various intervals between 10 minutes and 12 hours, expressed in hours:minutes (2:21 = two hours, 21 minutes). Each interval has two limits: a minimum time (top limit) and a maximum time (bottom limit).

Residual nitrogen times, corresponding to the depth of the repetitive dive, are given in the body of the lower portion of the table. To determine the residual nitrogen time for a repetitive dive, locate the diver's repetitive group designation from his previous dive along the diagonal line above the table. Read horizontally to the interval in which the diver's surface interval lies. The time spent on the surface must be between or equal to the limits of the selected interval.

Next, read vertically downwards to the new repetitive group designation. This designation corresponds to the present quantity of residual nitrogen in the diver's body. Continue downward in this same column to the row which represents the depth of the repetitive dive. The time given at the intersection is the residual nitrogen time, in minutes, to be applied to the repetitive dive.

If the surface interval is less than 10 minutes, the residual nitrogen time is the bottom time of the previous dive. All of the residual nitrogen will be passed out of the diver's body after 12 hours, so a dive conducted after a 12 hour surface interval is not a repetitive dive.

There is one exception to this table. In some instances, when the repetitive dive is to the same or greater depth than the previous dive, the residual nitrogen time may be longer than the actual bottom time of the previous dive. In this event, add the actual bottom time of the previous dive to the actual bottom time of the repetitive dive to obtain the equivalent single dive time.

EXAMPLE

Problem:

A repetitive dive is to be made to 98 fsw for an estimated bottom time of 15 minutes. The previous dive was to a depth of 102 fsw and had a 48 minute bottom time. The diver's surface interval is 6 hours, 28 minutes (6:28). What decompression schedule should be used for the repetitive dive?

Solution:

Using the repetitive dive worksheet:

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REPETITIVE DIVE WORKSHEET

1. PREVIOUS DIVE:

______minutes ☐ Standard Air Table

______feet ☐ No-Decompression Table

______repetitive group designation

2. SURFACE INTERVAL:

______hours ______minutes on surface.

Repetitive group from 1 __________

New repetitive group from surface Residual Nitrogen Timetable __________

3. RESIDUAL NITROGEN TIME:

______feet (depth of repetitive dive)

New repetitive group from 2 __________

Residual nitrogen time from Residual Nitrogen Timetable __________

4. EQUIVALENT SINGLE DIVE TIME:

______minutes, residual nitrogen time from 3.

______minutes, actual bottom time of repetitive dive.

______minutes, equivalent single dive time.

5. DECOMPRESSION FOR REPETITIVE DIVE:

______minutes, equivalent single dive time from 4.

______feet, depth of repetitive dive.

Decompression from (check one):
☐ Standard Air Table ☐ No-Decompression Table
☐ Surface Table Using Oxygen ☐ Surface Table Using Air
☐ No decompression required.

Decompression Stops: __________ feet __________ minutes

__________ feet __________ minutes

__________ feet __________ minutes

Schedule used__________ __________ feet __________ minutes

Repetitive group ______

RESIDUAL NITROGEN TIMETABLE FOR REPETITIVE AIR DIVES

*Dives following surface intervals of more than 12 hours are not repetitive dives. Use actual bottom times in the Standard Air Decompression Tables to compute decompression for such dives.

Repetitive group at the beginning of the surface interval

	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
A																0:10 12:00*
B															0:10 2:10	2:11 12:00*
C														0:10 1:39	1:40 2:49	2:50 12:00*
D													1:10 1:09	1:10 2:38	2:39 5:48	5:49 12:00*
E												0:10 0:54	0:55 1:57	1:58 3:22	3:23 6:32	6:33 12:00*
F											0:10 0:45	0:46 1:29	1:30 2:28	2:29 3:57	3:58 7:05	7:06 12:00*
G										0:10 0:40	0:41 1:15	1:16 1:59	2:00 2:58	2:59 4:25	4:26 7:35	7:36 12:00*
H									0:10 0:36	0:37 1:06	1:07 1:41	1:42 2:23	2:24 3:20	3:21 4:49	4:50 7:59	8:00 12:00*
I								0:10 0:33	0:34 0:59	1:00 1:29	1:30 2:02	2:03 2:44	2:45 3:43	3:44 5:12	5:13 8:21	8:22 12:00*
J							0:10 0:31	0:32 0:54	0:55 1:19	1:20 1:47	1:48 2:20	2:21 3:04	3:05 4:02	4:03 5:40	5:41 8:40	8:41 12:00*
K						0:10 0:28	0:29 0:49	0:50 1:11	1:12 1:35	1:36 2:03	2:04 2:38	2:39 3:21	3:22 4:19	4:20 5:48	5:49 8:58	8:59 12:00*
L					0:10 0:26	0:27 0:45	0:46 1:04	1:05 1:25	1:26 1:49	1:50 2:19	2:20 2:53	2:54 3:36	3:37 4:35	4:36 6:02	6:03 9:12	9:13 12:00*
M				0:10 0:25	0:26 0:42	0:43 0:59	1:00 1:18	1:19 1:39	1:40 2:05	2:06 2:34	2:35 3:08	3:09 3:52	3:53 4:49	4:50 6:18	6:19 9:28	9:29 12:00*
N			0:10 0:24	0:25 0:39	0:40 0:54	0:55 1:11	1:12 1:30	1:31 1:53	1:54 2:18	2:19 2:47	2:48 3:22	3:23 4:04	4:05 5:03	5:04 6:32	6:33 9:43	9:44 12:00*
O		0:10 0:23	0:24 0:36	0:37 0:51	0:52 1:07	1:08 1:24	1:25 1:43	1:44 2:04	2:05 2:29	2:30 2:59	3:00 3:33	3:34 4:17	4:18 5:16	5:17 6:44	5:45 9:54	9:55 12:00*
	0:10 0:22	0:23 0:34	0:35 0:48	0:49 1:02	1:03 1:18	1:19 1:36	1:37 1:55	1:56 2:17	2:18 2:42	2:43 3:10	3:11 3:45	3:46 4:29	4:30 5:27	5:28 6:56	6:57 10:05	10:06 12:00*
NEW GROUP DESIGNATION ⟶	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A

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RESIDUAL NITROGEN TIMES (MINUTES)

REPETITIVE DIVE DEPTH	Z	O	N	M	L	K	J	I	H	G	F	E	D	C	B	A
40	257	241	213	187	161	138	116	101	87	73	61	49	37	25	17	7
50	169	160	142	124	111	99	87	76	66	56	47	38	29	21	13	6
60	122	117	107	97	88	79	70	61	52	44	36	30	24	17	11	5
70	100	96	87	80	72	64	57	50	43	37	31	26	20	15	9	4
80	84	80	73	68	61	54	48	43	38	32	28	23	18	13	8	4
90	73	70	64	58	53	47	43	38	33	29	24	20	16	11	7	3
100	64	62	57	52	48	43	38	34	30	26	22	18	14	10	7	3
110	57	55	51	47	42	38	34	31	27	24	20	16	13	10	6	3
120	52	50	46	43	39	35	32	28	25	21	18	15	12	9	6	3
130	46	44	40	38	35	31	28	25	22	19	16	13	11	8	6	3
140	42	40	38	35	32	29	26	23	20	18	15	12	10	7	5	2
150	40	38	35	32	30	27	24	22	19	17	14	12	9	7	5	2
160	37	36	33	31	28	26	23	20	18	16	13	11	9	6	4	2
170	35	34	31	29	26	24	22	19	17	15	13	10	8	6	4	2
180	32	31	29	27	25	22	20	18	16	14	12	10	8	6	4	2
190	31	30	28	26	24	21	19	17	15	13	11	10	8	6	4	2

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